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SYMONS'S

MONTHLY

METEOROLOGICAL

MAGAZINE.

VOLUME THE THIRTY-FIRST.

1896.

LONDON:
EDWARD STANFORD, COCKSPUR STREET, S.W.

1897.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXI.] FEBRUARY, 1896. [PRICE FOURPENCE, or 5s. per ann. post free.

OUR THIRTY-FIRST VOLUME.

IT does not often happen that the same person writes the Introduction to the first, and to the thirty-first, annual volume of a periodical, and it must be still more rare for an Editor to be able to look back upon 360 consecutive monthly numbers and to remember only one which appeared without his personal supervision, and certainly the uniform health which has rendered it possible for me to do so demands thankful recognition.

When starting my small craft I had little encouragement, for a somewhat similar but, in some respects, better manned vessel had been started and had foundered within six months; but I thought that some such periodical was needed, and launched my little bark with a brief Introduction which closed with the following sentence:

> "Lastly, I need hardly say, that its future depends very much upon its readers; if they will send me prompt and full information of any unusual occurrence in their neighbourhood, and if they will (if they think it good) recommend it to their friends, the two essentials of high quality and a paying circulation may be obtained, and so I may be able to enlarge it, though my maxim always is, say everything in as few words as possible."

My readers did help me, and so we have gone on these thirty years, and though of course many have passed away, I see that nine of the writers in the first number (and also the printer) are with us still. As to how the craft has been steered it is not for me to say, but of one thing I am very proud, viz., that (perhaps because it is so small) the *Meteorological Magazine* is not merely taken in, but it is *read*. I try hard to avoid mistakes, but whenever a misstatement occurs, I hear of it, and no Editor could receive a higher compliment.

GENERAL INDEX.

There is one point upon which I should be glad to know the opinion of my readers. Would they like to have a *General Index to the "Meteorological Magazine," Vols. I.–XXX?* It would take a long time to prepare, and it certainly "won't pay." I think that it would be

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useful, but my judgment may be biassed. I therefore issue wit this number a sort of voting paper so that those who desire i may intimate their wish.

And now with thanks to those who have helped in the past, an relying upon similar aid in the future, I must proceed with tha editorial work which has always been a duty and a pleasure.

G. J. SYMONS.

62, *Camden Square, N. W., February 11th*, 1896.

THE MILD WINTER.

THE contrast between the severe frost of February, 1895, and the mildness of January and of the first half of February, 1896, has led to the printing of some very random statements. We give a few facts which will show that, though mild, there has been nothing very exceptional:—

Shade Temperatures at Camden Square, London.

		Absolute Max.	Absolute Min.	Mean Max.	Mean Min.	Mean.
1895	Dec.	56°4	26°1	44°9	35°2	40°0
1896	Jan.	52·7	28·0	45·4	36·5	41·0
1868	Dec.	58·2	31·5	50·7	41·0	45·8
1869	Jan.	56·3	25·0	46·3	35·9	41·1
1876	Dec.	56·6	23·2	47·8	40·4	44·1
1877	Jan.	56·4	28·5	48·5	37·4	42·9
Number of years with higher values than 1895-6.	Dec.	11	13	16	16	17
	Jan.	23	4	11	8	11
1868	Dec.	58·2	31·5	50·7	41·0	45·8
1895	,,	56·4	26·1	44·9	35·2	40·0
1868 warmer by		1·8	5·4	5·8	5·8	5·8
1884	Jan.	55·6	32·2	48·8	39·2	44·0
1896	,,	52·7	28·0	45·4	36·5	41·0
1884 warmer by		2·9	4·2	3·4	2·7	3·0

The temperature of December, 1895, was about 1° above the average, and was therefore in no way remarkable. The temperature of January, 1896, was about 3° above the average, but, as is shown above, has been exceeded in eleven years out of the last 36, or about every third year. In January, 1884, the air temperature never fell to freezing point, and the whole month was 3° warmer than January, 1896.

The fact is, the excessive frost of February, 1895, has impressed the public mind with the idea that our winters are usually something like it. We are very thankful that they are not.

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ROYAL METEOROLOGICAL SOCIETY.

THE annual meeting of this Society was held on Wednesday evening, January 15th, at the Institution of Civil Engineers, Mr. R. Inwards, F.R.A.S., President, in the Chair.

The Report of the Council showed that the Society was in a satisfactory condition, 34 new Fellows having been elected during the year.

Mr. Inwards devoted his Presidential address to the subject of "Meteorological Observatories," which he illustrated by means of photography. After describing some ancient observatories, including the Nilometers, and the Tower of the Winds, at Athens, he gave an account of National Observatories, of which the Royal Observatory, Greenwich, was taken as a type. High level observatories were next described, of which that of Mont Blanc was taken as a type. Special reference was also made to the Observatory on the Sonnblick, the high level observatory at Arequipa on the Andes, and that on Ben Nevis. An account was next given of Tower Observatories, together with some of the results obtained from the Eiffel Tower at Paris. Mr. Inwards, in concluding, said: "One can figure to one's self a tower piercing the air from any of the elevated table lands of this country, Salisbury Plain, the Stray at Harrogate, or the downs between Guildford and Dorking,—and from which the most interesting results could not fail to accrue. It is the opinion of M. Vallot, no mean authority, that a high tower is for air observatory purposes equivalent to a mountain station of ten times the altitude; and this is evident when one considers that any mountain must act as an obstacle which thrusts upwards the strata of the atmosphere into a form almost like its own, so that some of the effects are very little different from those observed below; while a tower like the Eiffel Tower thrusts itself into the air without obstructing its movements. It is the boast of the Royal Meteorological Society that it is gradually covering the country with a network of private observing stations, and is collecting together for the enlightenment of all future time, a mass of accurate knowledge on the subject of the changes in our atmosphere, its varying moods, its beating pulses, its calms and its convulsions, so that when the philosopher is born who is destined to unravel all its mysteries, he will have the tools and instruments ready to his hand."

Mr. E. Mawley, F.R.H.S., was elected President for the ensuing year.

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THE HIGH PRESSURE IN JANUARY.

In the first place, we have to express our regret at the mistake on p. 181 of our last volume, which requires correction by pasting the annexed slip over the upper portion of the table, and making the one other correction thereon mentioned.

Secondly, we have to record that a second maximum, also exceeding 30·9 inches, occurred at 11 a.m. on January 30th. The following little table contains all the instances of pressure exceeding 30·8 inches at Camden Square since 1858, and clearly shows how very remarkable it was for 30·9 to be exceeded on two occasions *within one month* :—

				in.
1859.....	Jan.	9th	11.40 p.m..... ...	30·830
1873.....	Feb.	18th	11.0 a.m.....	30·846
1879.....	Dec.	23rd	10.0 a.m.....	30·813
1882.. ...	Jan.	18th	10.30 a.m.....	30·975
1896.....	Jan.	9th	9.0 p.m.....	30·934
,, ...	Jan.	30th	11.0 a.m.....	30·927

It is noteworthy that all these maxima occurred between the hours of 9 and 12, *i.e.*, close to the time of maximum barometric tide.

Thirdly, we are very glad to mention that at the meeting of the Royal Meteorological Society on February 19th, Mr. R. H. Scott, F.R.S., will read a paper entitled, "Notes on the recent unusually high Barometer readings in the British Isles."

HIGH MONTHLY MEAN.

In London the mean pressure for the whole of January was very high, the readings, corrected and reduced, give 30·358 in. for 9 a.m. and 30·376 in. for 9 p.m., or (applying the correction for diurnal range) a mean for the month of 30·360 in., which has been exceeded only twice since the Camden Square record began, viz., in January, 1880, when the mean was 30·370 in., and in February, 1891, when it was 30·472 in. It is rather curious that the mean pressure in February, 1891, passed without special notice either in the publications of the Royal Meteorological Society or in the *Meteorological Magazine*—all our space and thought were apparently devoted to the drought.

The following table, compiled chiefly from a very valuable paper by Mr. Storks Eaton in Vol. vi. of the *Quarterly Journal* of the Roy. Met. Soc., and continued to date from our own observations, proves at once that, while pressure in January, 1896, has been remarkable (equalled about once in 15 years), that of February, 1891, was unprecedented as far as records extend.

Monthly Mean Pressures in the vicinity of London of 30·360 *in. or upwards.*

		in.			in.
1779.....	January	30·387	1854.... .	March	30·374
1780.....	December ...	30·401	1880.....	January	30·370
1797.....	February.....	30·400	1891.....	February... ..	30·472
1834.....	December ...	30·364	1896.....	January	30·360
1843.....	,, ...	30·423			

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VIOLENT LIGHTNING STROKE IN SOUTH DEVON.

MR CHANDLER, of Torquay Observatory, has favoured us with the cutting from a local paper which we reprint below. It is not easy to follow the narrative, and some statements seem improbable. It would have been both interesting and useful if some of our Devonshire readers had investigated the matter promptly, photographed the damage, and made a plan of the premises. Possibly even now something could be done. The story of the electric ball travelling "in an easterly direction, tearing up the ground in its course, until it reached the small wheel-house," ought to be capable of verification or contradiction even now.

THUNDERSTORM AT BRIXHAM.

WEDNESDAY, DECEMBER 18TH, 1895.

A MAN KILLED, OTHERS INJURED.

A thunderstorm broke over Brixham yesterday morning shortly before ten o'clock. Heavy showers of rain had fallen at intervals, from an early hour up to the time of the storm, when a bright blue sky with heavy white clouds and sunshine existed. The wind, which was blowing very moderately from the S.E., continued without any variation. Two bright flashes of lightning and two terrific peals of thunder were all that were seen or heard in the town generally, but in a field at Furzeham, part of which was occupied as a twine-walk, and where two men and a boy were at work, an electric ball or thunderbolt was observed by them in the west, and to travel in an easterly direction. tear-up the ground in its course until it reached the small wheel-house, where the boy sits to turn a small wheel for the spinners. The door of this small house was closed, and the fluid striking it shattered its lower part, and, passing on, knocked a hole right through the wall, and, making its exit through, flew upwards, striking the gable end of the roof of Mr. J. Varwell's ropery, knocking down the masonry and partially unroofing the establishment. It then entered the ropewalk and travelled 20 yards, damaging the side wall in its course, until it reached four men who were at work close together making yarn. The names of the men are William Morey, James Lowe, Edward Mitchell, and Samuel Webber. Morey, who happened to be stooping at the time, was struck on the top of the head and killed instantly; Lowe, who was close to him, was struck across the abdomen and laid helpless, though he never lost consciousness; Mitchell received a severe shock in both legs and was knocked down, but it did not injure him; Webber escaped free. As soon as possible medical aid was sent for, and in a short time Drs. Elliott and Hayward were on the spot, and every effort was made by them to restore animation in Morey but without avail, and his body was conveyed to his home. The injuries to Lowe were of such a nature as to necessitate his being kept at the residence of the foreman of the works until one o'clock, when he was taken home. His condition is critical. A railway porter and another man in the employ of Derry and Co., carriers, both of whom were in the goods shed, received severe shocks. One said he felt dazed and had pains about his body. Fishermen at the moorings in the outer harbour report that the electric fluid ran along the chains on the decks of their vessels, and that on Monday night at sea the crew

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of one fishing vessel saw three electric or phosphorescent balls on their mast and rigging. Such are often seen, but seldom more than one at a time. William Morey was single and 38 years of age. Hundreds of persons visited the ground in the neighbourhood of Mr. Varwell's Ropery, where the ground is torn up for upwards of a hundred yards. Such a thing has never been known in the district before.

REVIEWS.

Régime des pluies de la péninsule Ibérique, par M. ALFRED ANGOT—[Excerpt Annales Bureau central Météorologique de France, 1893, Tome 1]. 4to, 38 pp., 4 plates.

Sur le régime pluviométrique de l'Europe Occidentale, par M. A. ANGOT—in Annales de Géographie, No. 19, Oct. 15, 1895. A. Colin and Co., Paris; 8vo, 10 pp., 1 folding coloured map.

M. ANGOT is to be congratulated on having finished a heavy piece of work, which he has apparently spared no pains to make accurate.

The two portions of it which we have now to notice, are to some extent complementary to, and explain, each other.

The task which M. Angot has undertaken is that of ascertaining the mean rainfall of Western Europe—no slight labour in any case, but augmented considerably by the mode in which the work has been done. M. Angot, in the first place, decided that he would get rid of all irregularities due to secular change, by utilizing for all stations the same 30 years (1861-90), and where the record did not cover the full 30 years he has computed the value by differentiation from three or four surrounding stations—and this he has done not merely for the yearly totals but for each month. The result of this is, that whereas there are in the whole of Spain and Portugal only 9 stations of which the records are perfect for the whole 30 years, there are 79 others for which the monthly means for the 30 year period have been computed from all available data. M. Angot is in no way whatever responsible for the shortness of many of these records, and he has made the best of them, but we think that it would have been well to give in the tables on pages B 165 to B 167 the number of years' records upon which the computed values were based. As the table stands, the figures for Burgos, Palencia and Soria look equally important, but though the first and last are based upon observations during 29 years, the mean for Palencia is based upon only two complete years, and the record looks to us so doubtful that we believe that M. Angot would have given better values for Palencia if he had invented them all. Either the number of years from which each mean had been computed should have been stated, or all those based upon less than 15 years should have been printed in different type.

On p. B 176, M. Angot discusses the variation in annual fall from year to year for 21 stations, and brings out some such very startling

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results, that we have taken five colums from his table on page B 176, arranging the stations in the order of the amount of their mean rainfall, and adding three columns.

TABLE.

	Mean Rainfall.	Max. yearly fall.	min. yearly fall.	Ratio. $\frac{M}{m}$	Mean Rainfall.	Mean being 100. Max. yearly fall.	Min. yearly fall.
	mm.	mm.	mm.		inches.		
Santiago	1652	2336	942	2·5	65·04	141	57
Bilbao	1247	1728	902	1·9	49·10	139	72
Porto	1226	2110	606	3·5	48·27	172	50
Oviedo	935	1264	640	2·0	36·81	135	69
Guarda	898	1647	457	3·6	35·36	184	51
Gibraltar	822	1383	371	3·7	32·36	168	45
San Fernando	744	1236	390	3·2	29·29	166	52
Lisboa	726	1145	438	2·6	28·58	158	61
Soria	594	851	281	3·0	23·39	143	47
Huesca	591	857	345	2·5	23·27	145	58
Burgos	563	777	320	2·4	22·17	138	57
Campo Maior	560	886	302	2·9	22·05	158	54
Barcelona	537	978	272	3·6	21·14	182	51
Valencia	486	1288	191	6·7	19·13	266	39
Sevilla	471	880	159	5·5	18·54	187	34
Palma	453	669	239	2·8	17·84	148	53
Alicante	446	936	204	4·6	17·56	210	46
Madrid	419	698	259	2·7	16·50	167	62
Murcia	380	765	193	4·0	14·96	201	51
Zaragoza	314	426	215	2·0	12·36	135	68
Valladolid	313	442	142	3·1	12·32	141	45

We do not know whether there is anything in Spain and Portugal different from all other parts of the world, or whether the observations have been wrongly made, but the range between the wettest and the driest years is much above what we have heard of in any other country. Usually the wettest year has scarcely half as much again as the mean, *i.e.*, 150 per cent., but at 12 out of the above 21 stations the ratio exceeded 150, and at three stations exceeded 200, and reached 201, 210 and 266 respectively.

So with reference to dry years, the fall in a single year may in rare cases go down to half the average, or to a ratio of 50, but 6 of these 21 stations go below that, and two of them below 40. In our notice of Dr. Hellmann's work upon the same subject, written nearly 10 years ago (*Met. Mag.*, xxiii. (1888), p. 82), we called attention to the same feature, and there can be no doubt that Central Spain is liable to exceptionally severe droughts.

Here, for instance, is a list of yearly totals, all below seven inches :—

Albacete	1867	...	6·97	Salamanca	1875	...	4·88
Badajoz	1871	...	5·08	Sevilla	1874	...	6·26
Lerida	1882	...	6·58	Valladolid	1875	...	5·59
Palencia	1890	...	6·42				

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As regards the means, we have compared the values for stations given both by Dr. Hellmann and by M. Angot, and we find that there are 21; that as to 8 they agree within an inch, and as to 14 they agree within two inches, and in only two cases, Valencia and Porto, do they differ more than three inches (3·2 in. and 4·3 in.); the mean difference is less than half-an-inch.

M. Angot does not like the raininess of the months being indicated by the percentage of the yearly total which falls in each, because the months are of unequal length. We object as strongly as anyone to the shortness of February, and think that posterity will wonder why it has been allowed to be too short for so many years, but as long as the months are as they are, and retain their present names, so long do we think that it would be a pity to attempt to correct for the irregularity. We do not think that at present there is any more simple and effective mode of treatment than the old one of percentages.

However, we must pass on to M. Angot's other paper; and here we have evidence of the mass of work which he must have done, for we have a map with seven shades of tinting for mean rainfall of, roughly, under 16 in., 16 in. to 20 in., 20 in. to 24 in., 24 in. to 32 in., 32 in. to 40 in., 40 in. to 60 in., and over 60 in., and this for the whole of Europe west of the meridian of Rome up to lat. 60° N., and including parts of Germany, east of Berlin, and of Norway, and Sweden. The printing is so sharp, and the scale of the map such, that the boundaries of the areas can be read within two or three miles, and the number of patches representing areas of 20 or 30 square miles indicates how closely the stations of which the means have been computed must have been situated.

The map occupies about 150 square inches, and there are portions where the work is so fine that it would take a week to verify one square inch; therefore we can only speak generally, and that we are glad to do very favourably. We believe it to be the best general map of the rainfall of Western Europe yet issued. There is only one fact which strikes us as improbable, viz.—that very often the isohyetal lines (lines of equal mean rainfall) cross the rivers at approximately right angles; considering that a river is at the bottom of a valley, the effect of elevation would generally tend to make the lines parallel with the rivers rather than perpendicular to them. But, as we have already intimated, it is impossible until the whole of the details are published, to say more than that M. Angot has evidently taken extreme care, and produced a very valuable map. The accompanying text is, of course, accurate, and, besides that, it is pleasantly written, and explains the principal features of the distribution of rain in Western Europe both as regards quantity and seasonal distribution.

We anticipate with pleasure the appearance of the other sections of this great work.

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Terrestrial Magnetism: *An International Quarterly Journal.* Published under the auspices of the Ryerson Physical Laboratory, A. A. Michelson, Director; edited by L. A. BAUER, with the co-operation of the following Associates:—C. Abbe, P. Baracchi, W. von Bezold, E. Biese, F. H. Bigelow, C. Börgen, C. Chistoni, W. Doberck, M. Eschenhagen, J. Hann, G. Hellmann, S. C. Hepites, D. A. Goldhammer, A. Lancaster, C. Lagrange, S. Lemström, G. W. Littlehales, J. Liznar, T. C. Mendenhall, T. Moureaux, F. E. Nipher, L. Palazzo, van Rijckevorsel, A. W. Rücker, E. Schering, A. Schmidt (*Gotha*), C. A. Schott, A. Schuster, M. Snellen, E. Solander, I. P. van der Stok, R. F. Stupart, A. de. Tillo, H. Wild. Chicago: The University of Chicago Press. Royal 8vo., 54 pp., plate.

AND so the pole to which all literature on Terrestrial Magnetism is to flow is fixed in Chicago. We have adopted the unusual practice of setting out in full the title page of the new journal, because the title-page is itself as unprecedented as is the publication: never before was such a galaxy of names on the title-page of any periodical, never was the word International more fully deserved. We may further remark that such a journal was very much wanted, and that in the interest of scientific progress we sincerely hope that it may have a long and prosperous career; our only doubt is whether there are in the world enough persons interested in the subject, and capable of following the papers, to make the circulation a financial success. We know that some Americans do not hesitate to carry on publications even if they lose money by every number that they issue; we hope that *Terrestrial Magnetism* will be a financial as well as a scientific success; but if not, we hope that some of the rich citizens of Chicago will see to it that Dr. Bauer's spirited attempt does not fail for lack of financial support. Probably the loss, if any, will be borne by the Ryerson Physical Laboratory.

The journal will be in every respect international, even as far as language is concerned, for the prospectus states that though preferably one of the main languages should be used, yet any language which can be printed with Roman characters will be admitted, and in this number the first paper is English (by Dr. Schuster, F.R.S., of Manchester), the second German (by Dr. Schmidt, of Gotha), and the third English (by the Editor). The latter part is mostly English.

The printing and paper are exquisite, and there is an excellent reproduction of the very rare and probably earliest Equal Variation Chart of (?) 1701. Under the head of "Notes," we have a series of very interesting brief notices of nearly all that has occurred of importance in connection with Terrestrial Magnetism during the last six months. All advanced students of the subject must make themselves masters of the papers in this journal, and we trust that there is before it a very long and useful career.

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taking the mean for each date and subsequently Bloxamizing the curve with averages of 10 days. The result is general irregularity, but a very marked absence of days of rain between June 23rd and July 3rd, and yet the author says (perhaps rightly), "It need hardly be said, however, that no one who is 'weather wise' would build immoderate hopes on this or any other part of summer!" But if, when you have got out a striking result, you are not to build upon it, why take the trouble of getting it out?

TWO REMARKABLE TELEGRAMS.

We are rather inclined to regard telegrams with suspicion. Two have, however, been published within the last few days, which, if true, are so important that, subject to the above caution, we epitomize their statements.

EXPLOSION OF A METEORITE OVER MADRID.

Reuter's Agency reported from Madrid that on Monday, February 10th, at 9.29 a.m., a vivid glare of blinding light was followed in 1½ minutes by a loud report, the concussion being such as not merely to create a panic, but to break many windows, and in some cases to shake down partitions. The sky was clear, and the sun shining brightly, when a white cloud, bordered with red, was seen rushing from S.W. to N.E., leaving behind it a train of fine white dust. A red tinted cloud was long visible in the E.

If all the statements are correct, we should infer that the meteor was of exceptional magnitude, probably weighing from 100 to 300 lbs., and that it burst within about 15 miles of Madrid, but very probably at a considerable altitude above the soil.

We notice that Reuter's Agency call it an "aerolite." We thought that an aerolite differed from a meteor or meteorite in that the former was chiefly stone, the latter chiefly iron and nickel; but on turning to a dictionary we find no distinction drawn between the two; and worse still, on looking into the best English book upon the subject, Dr. Flight's *Chapter in the history of Meteorites*, we find the two words used indiscriminately.

REACHING THE NORTH POLE.

Some years since Dr. Nansen achieved great distinction by crossing Greenland. In 1893 he started with five years' provisions and the full intention of reaching the North Pole. A telegram has arrived from Irkutsk, in Siberia, stating that he has reached the Pole, found land in the neighbourhood, and is returning. All honour to the "Hardy Norseman" if he really has succeeded.

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SUPPLEMENTARY TABLE OF RAINFALL, JANUARY, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall.	·84	XI.	Lake Vyrnwy	2·02
,,	Birchington, Thor	·84	,,	Corwen, Rhug	1·53
,,	Hailsham	1·15	,,	Carnarvon, Cocksidia ...	2·48
,,	Ryde, Thornbrough	·99	,,	I. of Man, Douglas	2·49
,,	Emsworth, Redlands ...	1·15	XII.	Stoneykirk, Ardwell Ho.	2·44
,,	Alton, Ashdell	1·31	,,	New Galloway, Glenlee	3·80
III.	Oxford, Magdalen Col..	·60	,,	Lilliesleaf, Riddell	1·25
,,	Banbury, Bloxham	·82	XIII.	N. Esk Res. [Penicuick]	1·10
,,	Northampton, Sedgebrook	1·31	,,	Edinburgh, Blacket Pl..	·84
,,	Alconbury	·99	XIV.	Glasgow, Queen's Park..	1·54
,,	Wisbech, Bank House...	1·16	XV.	Inverary, Newtown	5·56
IV.	Southend	·79	,,	Oban, The Corran	...
,,	Harlow, Sheering..... ...	·84	,,	Islay, Gruinart Schools..	3·29
,,	Colchester, Lexden	1·04	XVI.	Dollar.....	2·35
,,	Rendlesham Hall	1·24	,,	Balquhidder, Stronvar...	4·82
,,	Diss	...	,,	Ballinluig	1·36
,,	Swaffham	1·54	,,	Dalnaspidal H.R.S.....	4·93
V.	Salisbury, Alderbury ...	·94	XVII.	Keith H.R.S.....	1·32
,,	Bishop's Cannings	·87	,,	Forres H.R.S.	1·28
,,	Blandford, Whatcombe.	1·34	XVIII.	Fearn, Lower Pitkerrie..	...
,,	Ashburton, Holne Vic...	1·69	,,	N. Uist, Loch Maddy ...	5·41
,,	Okehampton, Oaklands.	1·55	,,	Invergarry.....	6·02
,,	Hartland Abbey	1·34	,,	Aviemore H.R.S.	2·31
,,	Lynmouth, Glenthorne.	·61	,,	Loch Ness, Drumnadrochit	3·05
,,	Probus, Lamellyn	1·42	XIX.	Invershin	1·64
,,	Wellington, The Avenue	·69	,,	Scourie	6·93
,,	Wincanton, Stowell Rec.	1·12	,,	Watten H.R.S.....	1·65
VI.	Clifton, Pembroke Road	·60	XX.	Dunmanway, Coolkelure	3·47
,,	Ross, The Graig	·37	,,	Cork, Wellesley Terrace	1·11
,,	Wem, Clive Vicarage ...	·84	,,	Killarney, Woodlawn ...	2·78
,,	Cheadle, The Heath Ho.	1·40	,,	Caher, Duneske	·89
,,	Worcester, Diglis Lock	·44	,,	Ballingarry, Hazelfort...	1·23
,,	Coventry, Coundon	1·33	,,	Limerick, Kilcornan ...	1·35
VII.	Ketton Hall [Stamford]	·77	,,	Ennis	...
,,	Grantham, Stainby	1·04	,,	Miltown Malbay	2·51
,,	Horncastle, Bucknall ...	1·01	XXI.	Gorey, Courtown House	1·02
,,	Worksop, Hodsock Priory	·69	,,	Athlone, Twyford	1·86
VIII.	Neston, Hinderton	1·26	,,	Mullingar, Belvedere ...	1·69
,,	Southport, Hesketh Park	·83	,,	Longford, Currygrane...	2·04
,,	Broughton-in-Furness ...	4·56	XXII.	Woodlawn	2·77
IX.	Ripon, Mickley.....	·64	,,	Crossmolina, Enniscoe ..	2·74
,,	Melmerby, Baldersby ...	·51	,,	Collooney, Markree Obs.	1·92
,,	Scarborough, Obs.	·86	,,	Ballinamore, Lawderdale	2·78
,,	Middleton, Mickleton ...	1·82	XXIII.	Lough Sheelin, Arley...	1·95
X.	Haltwhistle, Unthank...	1·95	,,	Warrenpoint.....	1·94
,,	Bamburgh	1·32	,,	Seaforde..	1·67
,,	Keswick, The Bank	3·20	,,	Belfast, Springfield	2·30
XI.	Llanfrechfa Grange	1·03	,,	Bushmills, Dundarave..	2·24
,,	Llandovery	2·20	,,	Stewartstown	1·55
,,	Castle Malgwyn	1·90	,,	Killybegs	4·29
,,	Builth, Abergwesyn Vic.	3·61	,,	Lough Swilly, Carrablagh	2·72
,,	Rhayader, Nantgwillt ...	2·75			

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JANUARY, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATUR Max. Deg.	Date	Min. Deg.	D
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	·78	— ·84	·22	25	9	52·7	17	28·0	2
II.		Maidstone (Hunton Court)...	·90	— ·65	·34	12	3	...	...	...	.
,,		Strathfield Turgiss	·45	— 1·36	·08	24*a*	10	53·7	17	22·2	2
III.		Hitchin	·70	— ·84	·24	24	11	51·0	2, 25	23·0	2
,,		Winslow (Addington)	1·14	— ·67	·33	24	12	52·0	15*a*	23·0	2
IV.		Bury St. Edmunds (Westley)	1·51	+ ·04	·44	24	8	52·0	2	25·0	2
,,		Norwich (Brundall)	1·01	...	·30	13	16	52·0	2	24·8	2
V.		Weymouth(LangtonHerring)	1·09	— 1·25	·26	24	12	53·0	25	29·0	1
,,		Torquay (Cary Green)	·64	...	·17	24	12	53·8	26	31·0	
,,		Polapit Tamar [Launceston]..	1·11	— 1·91	·31	13	16	54·7	1	22·8	6
VI.		Stroud (Upfield)	·50	— 1·70	·15	24	10	51·0	26	27·0	21
,,		ChurchStretton(Woolstaston)	1·00	— 1·16	·25	15	14	52·5	2	24·0	21
,,		Tenbury (Orleton)	·63	— 1·51	·22	24	8	54·4	17	23·5	21
VII.		Leicester (Barkby)	1·04	— ·72	·26	24	11	53·0	2	17·0	22
,,		Boston	·96	— ·43	·21	25	11	50·0	25	27·0	20
,,		Hesley Hall [Tickhill].....	·47	— 1·30	·10	10	12	54·0	2	25·0	21
VIII.		Manchester(PlymouthGrove)	·75	— 1·71	·21	14	10	53·0	2	27·0	20
IX.		Wetherby (Ribston Hall) ...	·12	— 1·77	·05	14	3	...	...	...	...
,,		Skipton (Arncliffe)	4·44	— 1·20	1·48	24	19	..	...	...	...
,,		Hull (Pearson Park).	·75	— 1·02	·21	13	10	53·0	2	25·0	23
X.		Newcastle (Town Moor)	1·36	— ·45	·32	26	13	...	...	...	...
,,		Borrowdale (Seathwaite).....	10·90	— 1·28	2·20	24	15	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	1·25	— 2·04	·56	24	11	...	...	...	...
,,		Haverfordwest	1·87	— 2·55	·69	24	17	52·6	2	26·0	21
,,		Aberystwith (Gogerddan) ...	2·71	— ·82	1·00	24	12	53·0	1	...	..
,,		Llandudno.....	1·20	— 1·08	·35	14	9	55·5	2	31·0	23
XII.	SCOTLAND.	Cargen [Dumfries]	2·11	— 1·66	·56	1	12	50·4	17*b*	21·2	23
,,		Jedburgh (Sunnyside).....	·90	— ·82	·25	15	11	52·0	27	17·0	23
XIV.		Colmonell	2·75	...	·60	15	13	57·0	27	22·0	9, 22
XV.		Lochgilphead (Kilmory)	4·09	— 2·05	·71	26	21	...	...	23·0	22
,,		Mull (Quinish).....	3·79	— 1·88	·61	26	20	...	...	...	...
XVI.		Loch Leven Sluices	1·70	— 1·20	·50	15	9	...	...	...	...
,,		Dundee (Eastern Necropolis)	·80	— 1·17	·20	14	14	53·0	17	22·0	23
XVII.		Braemar	1·86	— ·83	·60	27	14	47·3	17	18·2	23
,,		Aberdeen (Cranford)	·60	...	·12	15	13	52·0	17	28·0	9*f*
XVIII		Strathconan [Beauly]	6·00	+ 1·12	1·00	15	16	...	...	...	...
,,		Glencarron Lodge.....	10·41	...	1·34	16	23	55·4	27	22·9	9
,,		Cawdor [Nairn]	1·54	— ·63	·36	14	14	...	...	...	...
XIX.		Dunrobin	2·97	+ ·51	·53	14	14	55·0	18	28·5	9
,,		S. Ronaldsay (Roeberry).....	2·91	— ·04	·55	18	23	48·0	16*c*	26·0	14
XX.	IRELAND.	Darrynane Abbey.....	2·15	...	·71	24	16	...	...	...	...
,,		Waterford (Brook Lodge) ...	1·20	— 2·36	·42	24	11	55·0	17	26·0	21
,,		O'Briensbridge (Ross)	1·38	...	·42	24	12	...	...	...	...
XXI.		Carlow (Browne's Hill)	·86	— 2·04	·20	24	11	...	...	...	...
,,		Dublin (FitzWilliam Square)	·72	— 1·14	·21	13	14	56·8	2	27·9	21
XXII.		Ballinasloe	1·59	— 1·49	·40	1	20	54·0	2	21·0	10
,,		Clifden (Kylemore)	4·45	...	·85	23	16	...	...	...	...
XXIII		Waringstown	1·99	— ·66	·40	14	14	53·0	1, 2	25·0	9*g*
,,		Londonderry (Creggan Res.).	2·69	— ·73	·71	14	17	...	...	...	...
,,		Omagh (Edenfel)	1·79	— 1·23	·47	14	14	52·0	26	23·0	9

+Shows that the fall was above the average ; —that it was below it.

a—and 25. *b*—and 18, 27. *c*—and 17, 27. *d*—and 22. *e*—and 24. *f*—and 14, 21. *g*—and 19, 20, 2

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METEOROLOGICAL NOTES ON JANUARY, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The weather at first was dull and gloomy, but dry and settled until the 10th, when slight S fell, followed by light rains. The month generally was dry and very mild. Wren's nest with two eggs found on 18th; female flowers of hazel on 28th.

ADDINGTON.—A mild open month, with very little sunshine. The principal feature was the extremely high barometric pressure on the 9th and 10th, and again on the 30th. Buds on some trees getting very forward at the close.

BURY ST. EDMUNDS, WESTLEY.—A fine open month, with very little frost. Remarkable for the very high bar. of the 10th and 30th; S on 10th.

NORWICH, BRUNDALL.—A dry and mild month, with much haze and mist at times. No S all the month, and little frost, but the mean temp. was 1°·5 lower than in 1890. On the 9th the bar. (corrected and reduced) stood at 30·900 in.

WEYMOUTH, LANGTON HERRING.—The mean temp. at 9 a.m., 40°·9, is 2°·2 above the average of 24 years. The month was mild, and notwithstanding the very high bar. there was much damp weather. The readings of the bar. on the 9th and 10th were the highest since the register commenced, but were exceeded by ·01 in. on the 30th and 31st. Fogs on 1st, 18th, 25th, and 27th.

TORQUAY, CARY GREEN.—Rainfall 2·73 in. below the average. Mean temp. 43°·6, or 1°·9 above the average. Duration of sunshine 43 hours 40 minutes, being 27 hours 10 minutes below the average; 16 sunless days.

POLAPIT TAMAR [LAUNCESTON].—Though the atmosphere was generally very humid, the rainfall was very small. The month's rainfall is exactly the same as that of January, 1881, and the smallest in January since then. The mean of the max. and min. shade temperatures for the month is 41°·9. There were no storms, S, or H, and very little frost throughout. The bar. was remarkably high on the 9th, 10th, 29th, 30th and 31st. Thick fogs on 6th, 19th and 30th.

STROUD, UPFIELD.—S fell on 10th at 8 p.m.; gale in afternoon from N.W. on 15th.

WOOLSTASTON.—A beautiful open winter month, with frosts on the ground most nights. Mean temp. 39°·2.

TENBURY, ORLETON.—A warm dry month, with a mean temp. more than 3° above the average of 35 years. During the last 60 years there have been only four months of January with less R. Very little sun during the month, and for the first eight days the sun was never seen at all. S on 23rd; fog on many days.

LEICESTER, BARKBY.—A rather cloudy, but fine open month, with little R. High bar. readings in the first and last weeks. Mean temp. 38°·2.

MANCHESTER, PLYMOUTH GROVE.—Thick fog on 6th and 7th; dense fog on 8th, 12th, and 20th. Slight fall of S and sleet on 10th. Quite spring weather on 18th and 19th. Mean temp. 40°·5.

WALES.

HAVERFORDWEST.—The general character of the month was damp with a small rainfall; the smallest excepting January, 1855 (in which month only ·56 in. fell) in 47 years. From the 6th to the 12th low temp. prevailed, and again from 18th to 23rd it was very cold, but mostly overcast. The weather of the whole month was dull and cheerless and excessively damp. Remarkably high bar. readings occurred at 9 p.m. on 9th (30·984 in.), and 9 p.m. on 30th (30·927 in.)

ABERYSTWITH, GOGERDDAN.—A very quiet sunless month, with very high bar. readings.

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SCOTLAND.

CARGEN [DUMFRIES].—The feature of the month was the high bar. pressu The mean, 30°·151 in., has been several times exceeded, but the reading on t 9th, 30°·928 in., has never previously been reached since observations co menced in 1860, the nearest approach being 30°·838 in. on 18th January, 18 Extraordinary high pressure was recorded during the seven days 5th to 11 inclusive and during the last three days of the month. Between the 11th a 15th the bar. fell 1·63 in., and on the 15th a pretty severe westerly ga occurred. The mean temp. of the month is 2°·7 above the average, and h only five times been exceeded in 37 years, the highest mean temp. being 43° in January, 1882. Rainfall is much below the average, and except on the 1 was of a very light nature. Sunshine was again conspicuous by its absenc dull foggy weather prevailing during the month. Pastures were wonderful fresh and green, an appreciable boon in the face of bare stackyards and rapidly diminishing store of roots.

JEDBURGH.—The temp. generally was high, especially during the day. Th wind mostly S.W. and W. The rainfall has been less in only five Januarie during 32 years. Outdoor work never suspended and farm work far advanced Birds mating. Bar. very high from 4th to 13th. S 3 inches deep on 14th Snowdrops in bloom on 22nd, yellow aconite in bloom on 24th.

COLMONELL.—Rainfall 2·04 in. below the average of 20 years.

MULL, QUINISH.—Excepting from 15th to 19th, the month was exceptionally fine and mild. Temp. at 9 a.m. on 27th, 50°.

ABERDEEN, CRANFORD.—A very dry month all through.

S. RONALDSAY, ROEBERRY.—A fairly good month upon the whole. Bar. on 9th the highest recorded for 25 years. Mean temp. (39°·6) 1°·9 above the average.

IRELAND.

DARRYNANE ABBEY.—A very fine and remarkably mild month with very high bar. Slight frost on ground on 21st and 22nd. Fuchsias coming into leaf, and crocuses and daffodils in flower, at the close.

O'BRIEN'S BRIDGE, ROSS.—Mild open weather up to 12th, with remarkably high bar. and wind light from N. to N.E. Slight frosts from 18th to 22nd and frosty and bright at the close.

DUBLIN.—January proved very mild, often dull and damp with frequent, but scanty, rainfall. S on only one day and no H. It afforded a complete contrast in every particular to the severe January of 1895, and will be especially memorable for the record breaking readings of the bar. on the 9th (31·020 in. at 10 a.m.). The mean temp., 44°·3, is 2°·9 above the average. Lunar haloes were seen on the 19th and 24th. The atmosphere was foggy on 9 days. High winds occurred on 9 days, reaching the force of a gale on 2 days.

WARINGSTOWN.—At 3 p.m. on 9th the bar. (cor. and red.) stood at 31·059 in., a point never before reached here.

OMAGH, EDENFEL.—It is only by usage that the January just past can be called a winter month, as there was not a wintry day in it. The ground was not once white with S, and hardly once with hoar frost. With a rainfall below, a temp. above, the average and two anticyclonic periods of extraordinary intensity, the month altogether was more of an early autumnal than a winter character.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXII.] MARCH, 1896. [PRICE FOURPENCE, or 5s. per ann. post free.

EXTREME HEAT IN AUSTRALIA IN JANUARY, 1896.

THE Australians have had a very hot January, and in some parts hot beyond all precedent. We therefore give not merely the details, which Mr. H. C. Russell, F.R.S., has been so kind as to send from Sydney, but also a selection of notes and articles from various issues of the Melbourne *Argus*. It would, of course, be presumptuous for us to pretend to compile a record of the phenomena at our antipodes; but seeing the exceptional character of January and February in the British Isles, and the severity of the winter in parts of North America, we think that some popular notes of Australian weather at the same time may be interesting.

To the Editor of the Meteorological Magazine.

SIR,—I send the enclosed readings of the thermometers on our record day. I felt what was coming when I rose in the morning, and determined to follow the temperature by frequent readings. Both the thermometers are first-class; the Standard has a Kew certificate of + 0·1 at 72°, 82°, and 92°; of + 0·2 at 102°, ; and 112°, and the max. a certificate of no error from 32° to 92°. I have not applied the correction to the Standard; had I done so, the Standard readings at 1.20 p.m. would have agreed with the max., and at 2 p.m. have been 108°·7; but when the temperature is oscillating as it was at the top of the heat wave, I do not expect to get the temperature to a tenth of a degree. The cause of the heat was a hot land wind.

We are having a very hot summer. We have already had 95°·2 on 4th, 105°·2 on 6th, 98°·5 on 10th, 100°·0 on 11th, 108°·5 on 13th, and 99°·0 on 18th. I send you my pamphlet about icebergs. Those who hold that icebergs cool the weather will have a nut to crack with the icebergs on one hand, and these excessive heats on the other.—Yours faithfully,

H. C. RUSSELL.

Sydney Observatory, January 20th, 1896.

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Shade Temperatures at Sydney, January 13th, 1896.

Time.	A Kew Standard Thermometer.	First Class Max. Kew Certificate.	
	°	°	
6.0 a.m.	83·6		Temps. at 6, 7, and 8 taken from thermograph.
7.0 ,, ...	90·7		
8.0 ,, ...	94·3		
8.30 ,, ...	95·6	95·7	
9.0 ,, ...	97·7	97·6	
9.30 ,, ...	99·0	99·0	
10.0 ,, ...	100·0	100·0	
10.15 ,, ...	101·0	101·1	
10.30 ,, ...	101·9	101·9	
11.0 ,, ...	104·0	104·0	
11.15 ,, ...	104·2	104·4	
11.30 ,, ...	104·9	105·5	
11.45 ,, ...	105·4	105·7	
Noon	106·5	106·2	
0.3 p.m.	106·4	106·6	
0.15 ,, ...	106·2	106·9	
0.22 ,, ...	106·7	106·9	Humidity 25 by Indian Tables.
0.30 ,, ...	106.9	106·9	,, 26 ,, ,,
0.45 ,, ...	107·0	107·2	
0.55 ,, ...	107·0	107·4	,, 26 ,, ,,
1.10 ,, ...	108·0	108·2	,, 26 ,, ,,
1.20 ,, ...	108·3	108·5	
1.30 ,, ...	108·0	108·5	
1.45 ,, ...	108·2	108·5	
2.0 ,, ...	108·5	108·5	,, 22 ,, ,,
3.0 ,, ...	98·9	108·5	At 2.30 p.m. the fresh N.W. wind had died out and a light sea breeze came in.
3.15 ,, ...	98·5	108·5	
4.18 ,, ...	100·1	108·4	
5.0 ,, ...	98·0	108·3	Contraction of mercury.
6.0 ,, ...	88·7	108·2	
8.40 ,, ...	86·0	...	Wind changed to Southerly Burster at 9.30 p.m.
10.0 ,, ...	75·3	...	
10.30 ,, ...	72·8	...	
11.45 ,, ...	72·0	...	

This is the Sydney record day, the greatest heat ever known, certainly since 1859. Our record before was in January, 1863, 106°·9, when it rose quickly, *i.e.*, in 3 hours, and the sudden advent at 1 p.m. of a violent Southerly Burster cooled down the air 22° in 15 minutes. Our present record is remarkable not only for its heat but for its persistence.

In taking the readings I observed that if I happened to go when the temperature was rising, the thermometers agreed.

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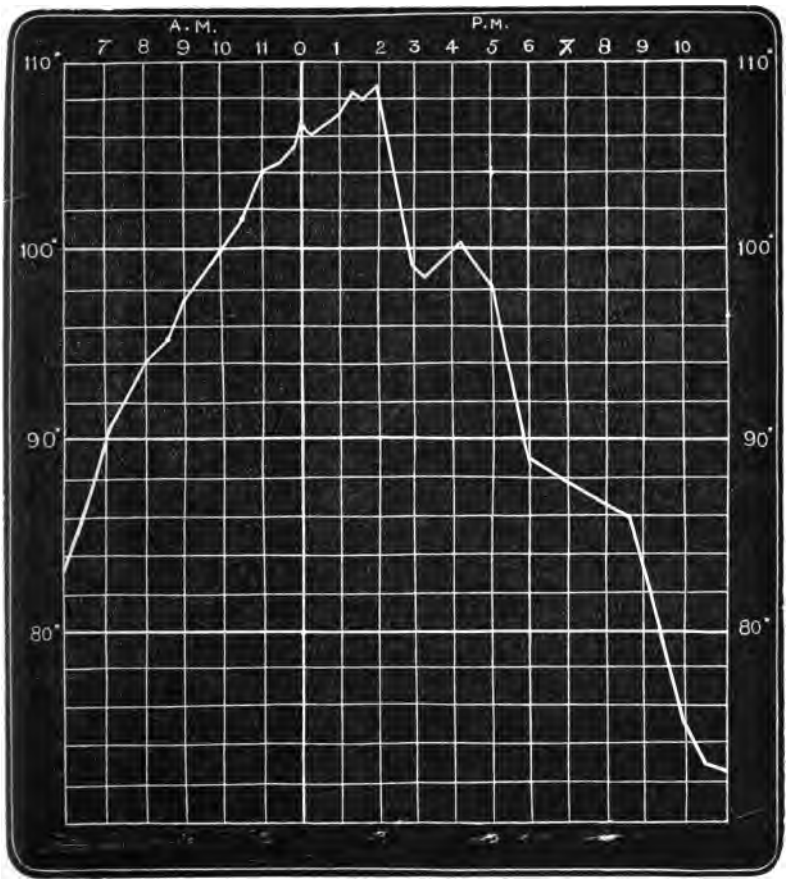
Shade Temperature at Sydney, N.S.W., January 13th, 1896.



A HOT DAY IN MELBOURNE.

108 DEG. IN THE SHADE.

It will hardly surprise those who had business in the city yesterday (January 23rd) to learn that the day was the hottest we have had for several years, though not, as many ventured to prophesy, the hottest on record. Three times during the many years that heat records have been kept in the Melbourne Observatory the temperature of yesterday was exceeded. The highest register was in January, 1862, when the shade temperature reached 111°·2. In 1876, 110°·7 was registered, and 110°·5 in the summer of 1882. With one exception, therefore, it will be seen yesterday, with a record in the shade of

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108 deg., was the hottest day we have had in Melbourne for 20 years—a reco quite sufficient to cause it to be remembered. The excessive heat was large due to the burning north-west wind blowing, and although many casu weather prophets had declared that some of the excessive heat of Riverir might be expected here, they were correct in their prophecy only by the pure chance. The Western Riverina heat cannot, save under exceptional condition affect us, and yesterday's record was purely a local achievement—happily wit sound local characteristics, too, inasmuch as a cool wind came suddenly u from the south at about 5 o'clock, and in about 10 minutes the thermomete fell 20 degrees. The change was the more agreeable inasmuch as it was totall unexpected, no electric couriers having announced its coming at the Observa tory. Ten minutes before it came the best that Mr. Baracchi could promis from the chart was a change within 24 hours. This cool burst came from of the west Tasmanian coast, and thus none of the Observatory outposts were able to announce its coming until it was absolutely here. The first sign of it in the city was a dense cloud of dust, and Melbourne, as seen from the outlook at the Observatory, was then a remarkable sight.

The excessive heat now experienced in New South Wales is largely due to the dry state of the country, for when there is little moisture in the air or soil such high records are to be expected. For the last few months our local rainfall in the south of Victoria has been up to the average, and the excessive heat in Melbourne yesterday is attributable almost entirely to the dry hot wind blowing. As showing the effect of moisture on the temperature, it is worth pointing out that at Port Darwin the temperature rarely exceeds 95°, owing to the moisture in earth and air, and the heat in these northern areas is the more trying solely because it remains pretty well the same night and day. Rarely is a sudden change with thunder and cooling showers such as followed yesterday's heat in Melbourne experienced in Western Riverina, so that those who judge the heat privations of that part of the country from what was experienced in Melbourne yesterday altogether underrate the sufferings of the people across the Murray.

THE HEAT IN THE COUNTRY.

The heat was very general throughout the colony, as the following advices from our correspondents, giving the record of the shade temperature at the different places, will show:—

All in Victoria.

Ararat, 99; Avenel, 108.
Ballarat, 102·5; Bendigo, 110; Bridgewater, 112.
Castlemaine, 104; Charlton, 110; Cobram, 107.
Donald, 112; Dunolly, 106; Drouin, 100.
Euroa, 104; Echuca, 112.
Frankston, 108.
Geelong, 110; Gisborne, 108.
Hopetoun, 113; Horsham, 112.
Kerang, 110; Kilmore, 105.
Minyip, 110; Macedon Upper, 101; Mildura, 120; Murchison, 109·5.
Nagambie, 110; Natimuk, 115.
Pakenham, 108.
Rupanyup, 114.
Swan Hill, 116; St. James, 110; St. Arnaud, 110; Somerville, 104.
Tatura, 110; Tallarook, 106; Traralgon, 104.
Wedderburn, 113; Wangaratta, 109.
Yarrawonga, 112.

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The flame-like sunshine—beneath which, over wide spaces of Australian soil, the grass is just now being turned into dust and the rivers into vapour—is not the most scorching element in the weather about which we are all grumbling. According to Mr. Russell, the Government Astronomer of New South Wales, the action of the sun is turning the waterless plains of the interior into the breeding ground of heat waves, which, with the breath of a thousand furnaces, come romping over cities and plains until the whole continent faints and droops under their white-hot ardours.

The heat wave has been sufficiently scorching in Victoria, but it has reached its highest intensity in New South Wales. The lamenting journals of that colony, for example, betake themselves to mediæval Latin to describe the horrors of a given day, a true *dies iræ!* On that day, indeed, the mercury in the thermometer only registered 108°, and there are traditions that on a yet more dreadful day in 1854, Sydney thermometers registered 113°. But Sydney heat has a most clinging and vaporous quality, under which the figures of the thermometer are helplessly inadequate as a measure of human discomfort. But even at 108° the bank of superheated steam drifted over the city roofs and out to sea, and 150 miles from the coast the ships that ran into it describe the experience as running into "a bank of flame." The human imagination turns aside from the spectacle presented by, say, Bourke, Wilcannia, or Camden. At Bourke the thermometer, for a whole week, oscillated between 113° and 121°. At Wilcannia 119° was a familiar record, and the airless heat of the nights was, on the whole, more cruel than the scorching glare of the day. In Camden, unless thermometers can lie, the heat rose to 123°. At the present moment apparently the perspiring crowds are fleeing from Bourke as the inhabitants of Pompeii fled from that city when Vesuvius was pouring upon it its tempest of burning ashes. Not a few pastoral towns in western New South Wales, as a matter of fact, threaten to be abandoned by their scorched inhabitants, and no wonder, for the heat wave is as cruel and as deadly as an average pestilence. Twenty-two deaths were registered in Bourke in five days; five deaths at Wilcannia were registered in a single day; in Sydney the heat wave wave killed 125 persons in one week. Professor Stuart, it is true, with the cold composure of science, assures the panting inhabitants of Sydney that "damp, muggy, and cold weather" kill more people than the most fervent heat wave. But the people of New South Wales at the present moment would probably welcome the frozen fogs of the North-West Passage as an exchange for the heat, as of a fever ward, or of a gas furnace, which is killing the very mosquitoes in New South Wales gardens. It is certain that across the mortality tables of 1895 the heat wave will scribble statistics which might alarm even a committee of undertakers.

The critics who are always glad to discover some scandal about the Australian climate need not rejoice too triumphantly. New York, for example, which alternates between a blizzard and a sun-bath, has worse records than Bourke or Wilcannia. On a given day in 1892, when the mercury in New York thermometers oscillated between 99° and 102°, no fewer than 223 deaths from excessive heat were registered in twenty-four hours. That particular American heat wave killed 600 people in three days in New York alone! In the matter of heat waves the foreign article, it is clear, is more deadly than even our local variety!—"*Argus*," *24th January*, 1896.

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Bush Fires in Gippsland.

Mirboo North, Jan. 9th.—The weather is very sultry, and bush fires are surrounding the township. Great damage has been done in the Allambee district. Messrs. Euring, Barton, Smith, Davies, O'Shea, and others have suffered a loss of grass, fencing, and in other ways, and it was only with difficulty that the fire could be kept within bounds. The selectors are working determinedly to subdue the flames, but the fires are still raging in different parts.

Bendigo, 9th.—The thermometer registered 99 deg. in the shade to-day. Rain is now promising.

Boort, 9th.—The weather has been very close for the past few days, reaching the exceptionally high register to-day of 112 deg. in the shade. The lakes are rapidly drying up. A welcome change appears to be coming, as heavy clouds are rising in the north-east.

Foster, 9th.—No rain has fallen to stay the ravages of the bush fires, the result being that the town is enveloped in smoke. No fires are reported from Stony Creek proper, nor from Fish Creek. To-day is very warm and sultry, with not a breath of air stirring.

Hopetoun, 9th.—To-day was the hottest day of the season, the thermometer showing 109 deg. in the shade.

Mildura, 9th.—The heat to-day was very intense, a hot, scorching wind blowing. The thermometer registered 114 deg. in the shade. About 5 o'clock there was a blinding dust storm, accompanied by light thunder. There were a few spots of rain only, but more seems pending. This is the record of heat for this summer.

Macarthur, 9th.—The excessive heat continues, being almost a repetition of Sunday (5th). Bush fires continue burning, and to-day the fire has crossed from Werrangourt into Eumerala West and Knebsworth. Mr. Donald Cameron had a narrow escape from losing his dwelling-house. This evening the fire entered the Braes Estate, and the properties of Messrs. Brankie, Mills, Quirk and Christie are in imminent danger. Owing to the high wind little can be done to check the flames. Rain is badly needed, as the crops are suffering and the grass is parched.

The Weather in the Other Colonies.

Brisbane, Jan. 9th.—Splendid rain is falling throughout the agricultural portion of the Mackay district.

Broken Hill, 9th.—It was very warm locally to-day, 111 deg. being registered in the shade at midday. After 1 o'clock, however, it increased to 113 deg., being the record for the season. It was very dusty throughout the morning, and in the afternoon a whirlwind of a cyclonic character came from the west down Oxide Street. One or two small habitations were wrecked and a verandah was carried away, and sheets of iron were gyrating aloft in all directions. The damage, however, was not serious, and no accidents are recorded. It is cooler this evening, with a heavy bank of clouds.

"*Argus*," 10*th January*, 1896.

ADELAIDE.—Max. in shade 111°·2 on 23rd.

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SEVERE FROST IN NORTH AMERICA.

The two following reports speak for themselves and show a remarkable contrast with the winter on this side of the Atlantic:—

"WINTER IN THE WEST.—It is interesting and rather disquieting to note that 'zero weather' of an unprecedently severe character is prevalent over New York and the Eastern States of America. In the Empire City, on Monday morning, Feb. 17th, the thermometer stood at nearly seven degrees below zero, showing, as the popular expression has it, 39 degrees of frost. This is said to beat the Meteorological Office's previous records, which extend over 28 years. During that period no reading so low has been registered so late in the month of February. New York, however, was torrid in comparison with its 'Hinterland.' In the interior of New York State readings of 20 and 30 below zero are said to have been common; while at Saranac, in the Adirondacks, a record of 49 degrees below zero was obtained. This truly Winnipeg reading, representing 81 degrees below freezing point, is supposed to be the lowest ever recorded in the Eastern States. The cold wave seems to have extended steadily over the Continent from the North-Westward, where they have been having a very cold winter. It is to be hoped that its progress in our direction will be stayed, since, with vegetation so far advanced as it is, and young plants full of moisture, anything resembling a severe frost would be a grievous calamity. Nevertheless, it is a familiar fact that we import most of our climate from America. The cold snap recently experienced, however, the nearest approach to winter we have had this year, came from a different quarter. It originated at the North Pole, and, oddly enough, arrived here simultaneously with the announcement that Dr. Nansen was returning from its birthplace."—*Newcastle Chronicle, February 20th.*

———

"SEVERE WINTER IN NEWFOUNDLAND.—The correspondent at St. John's of the Colonial Missionary Society, writing by the last mail, says:—'We are having a terrible winter here, perfect Arctic weather, worse than has been known for the past 40 years. Snow lies on the ground from 10 ft. to 15 ft. deep, country roads completely blocked, communication with the outposts almost entirely suspended owing to ice blockade. The suffering among the poorer classes is very great, especially in Fortune Bay, where the entire failure of the herring fishing has brought the people to the verge of starvation. We have done all we can in the way of relief, and I do not think there has been much actual suffering at our two stations; but the want in other destitute localities of the bay is said to be simply appalling.'" —*Times, March 3rd.*

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THE INDEX TO THE METEOROLOGICAL MAGAZINE.

To judge by the number of replies we should certainly not proceed with the above, for we have received only 48, and

$$48 \times 2/6 = £6,$$

which, even if all the writing and preparing and editing were done gratuitously, would probably be less than a quarter of the cost.

But, on the other hand, the 48 requests that have come are from some of the highest authorities upon meteorology in nearly all parts of Europe. I should not think of letting a small pecuniary loss prevent my doing that which men of such eminence think desirable, and, therefore, I shall put the work in hand as soon as time permits.

I can at present form no definite idea as to the cost. The indices to the individual volumes make collectively about 90 pages, the general index will probably be considerably more—possibly 150 pages; and, if so, the cost, including paper and binding, may run up to £40 or so. But, as is always the case, friends are ready to help. One (I have not asked his permission, so I must not at present mention his name) has offered to assist in preparing the MS., and another has sent the following considerate letter:—

To the Editor of the Meteorological Magazine.

DEAR SIR,—As you ask for an expression of opinion with reference to a General Index for the magazine, I venture to say that I think there can be no question about its usefulness. As I am on the point of having the whole series bound I was, by a curious coincidence, only a few hours before I received the February number, debating whether I should have the "Title and Index" sheets of all the volumes bound up together in one Index Volume or not. If a complete Index for thirty years was issued it would solve that difficulty, and make it very easy to find any subject required.

I regret to see that you say it "won't pay." Might I suggest that if in the next number of the magazine you were to print an approximate estimate of the cost, there might be found some amongst your subscribers who would not only be willing to pay the half-crown for their own copy, but also to subscribe something in addition towards defraying the extra cost. At any rate I would be very willing to do so.

In concluding this letter, I trust I may, without presumption, be permitted to congratulate you on your long and successful career as Editor of this magazine, and to express a hope that you will be spared for many years to come to illustrate the cardinal doctrine of continuity which you have so persistently and successfully advocated in all matters pertaining to meteorology.—I am, yours sincerely,

CHARLES L. BROOK.

Harewood Lodge, Meltham. Feb 21st, 1896.

As already explained, no satisfactory estimate can be submitted

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until the MS. is ready, but the sales ought to produce £15, and if so, the loss would probably be about £20 or £30. However, the first thing to be done is to put the work in hand, and if when the accounts come in there is a serious deficiency, I am quite sure that some of my correspondents will act upon Mr. Brook's suggestion, and come to the rescue.

Possibly some one may think that I ought to have known that few copies would be ordered, and to have made the price 5s., instead of 2s. 6d., and thereby diminished the probability of loss. I did consider that point, but I wanted the Index to be as widely useful as possible, both as regards its contents and its circulation. After every one has had the option of procuring a copy, it may be a question whether the price of any remaining in stock should not be doubled, or even quadrupled. They may become as scarce as the Indexes to our charming contemporary *Notes and Queries*.

G. J. SYMONS.

THE GREAT MADRID METEOR.

[We are glad to be able to supplement the notice in our February number by the following official report from the Director of the Observatory, which we have abridged, and annotated from the original which appeared in *Nature* of February 27th.—ED.].

ON Monday, February 10th, at 9h. 29m. 30s., there was observed an instantaneous bluish-white illumination in the atmosphere, so strong and vivid as to be visible in the inner rooms and in the open air.

The day was a magnificent one; blue sky, no wind, and a radiant sun.

Soon after there was plainly visible near the zenith, and some few degrees to the south-east, a white spot, like smoke, bearing north-east to south-west, of about 6° length and 1° wide; its form was semi-circular, with the convexity turned to the east. In the centre, and near the apex of the curve, it presented a condensation of a reddish colour, similar to that of clouds at sunset. The general appearance of the spot was that of a light cirro-cumulus.

At 9h. 30m. 40s. there was heard a deep and very strong detonation, accompanied by many others not so intense, similar to the noise produced by a large cannon-ball rolling along the upper storey of a house. This noise was very prolonged; it was found to last two minutes.

Meanwhile the vibration of windows and partitions (not the thick walls) was extraordinary, and the rattling of panes of glass alarming. In some houses all the window-panes were broken.

Judging from the time which elapsed between the light and the sound of the first detonation, the meteor exploded in the air at a

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distance not less than 24 kilometres (15 miles); and this number is evidently too low.

Considering the aspect of the spot of smoke, it seems probable that the meteor proceeded from the south-east towards the north-west, and that near the zenith of Madrid it exploded.

Changed into smoke and dust, totally or partially, this smoke was carried away by the upper currents of the atmosphere to the east. We find here a splendid confirmation of the theory which supposes that, at the upper limits of the air, the wind moves from west to east.

A photograph of the phenomenon was taken by an amateur some few minutes after the explosion.

The cloud continued its course to the E.N.E., or E. ¼ N.E., dissolving gradually away, and at 3 p.m. [5½ hours afterwards! ED. *M.M.*] it was still perfectly visible like a light cirrus in the east some 20° above the horizon.

The compression of the atmosphere at the instant of the conflagration was indicated by the registering barometers. In the aneroids the trace is small, but the mercurial one shows that the column rose 1·6 mm (·063 in.), and lowered 0·7 mm (·028 in.), the amplitude of the total oscillation being 2·3 mm (·091 in.).

In the neighbourhood of Madrid some fragments of the meteor fell, and I have obtained one of them. Externally the fragment is of a black metallic aspect; inside it is of white stony appearance, with some brilliant points like nickel; it weighs 6·3 grams (¼ oz.).

From information received later, it appears that the phenomenon was visible in a large part of the Peninsula, from Sierra de Estrella (Portugal) to Denia on the Mediterranean coast, and from Segovia to Aguilas, or a distance of 700 kilometres (435 miles) from east to west, and 400 kilometres (250 miles) from north to south. These are inferior limits.

AUGUSTO ARCIMIS.

HIGH BAROMETER.

To the Editor of the Meteorological Magazine.

SIR,—There have been now two *consecutive* months, *i.e.*, January and February last, of abnormally high barometrical pressure; the 9 a.m. mean here for January being 30·361 in. and for February, 30·356 in., is not this very unusual?—Yours obediently,

K. I. MARKS.

9, *Randolph Gardens, Maida Vale, W., 4th March*, 1896.

[As far as we can trace, the only parallel case, and it is noteworthy as covering *three months*, instead of two, was in 1779, when the means were:—

January ... 30·387 in. February ... 30·332 in. March ... 30·270 in.

ED.]

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ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, February 19th, at the Institution of Civil Engineers, Westminster. Mr. Edward Mawley, F.R.H.S., President, in the chair.

The Report on the Phenological Observations for 1895 was presented by Mr. Mawley, in which it was shown that, owing to the great frost at the beginning of 1895, all the first spring flowers made their appearance very late; and it was not until the middle of June that this retardation was overcome. During July the dates recorded were, as a rule, exceptionally early. The yield of all the farm crops, except potatoes, was exceedingly poor. Pears and plums yielded badly, but there was a splendid crop of apples and also of all the small fruits. As regards vegetation generally, seldom has a year ended under conditions as favourable for the one succeeding it.

Mr. R. H. Scott, F.R.S., read a paper on the recent unusually high barometer readings in the British Isles, in which he stated that the daily weather chart for 6 p.m., on January 8th, was the first in these islands that ever showed 31 inches. The station was Stornoway, and by the next morning, all over the northern portions of Great Britain and Ireland, the barometers were above 31 inches. The highest reading of all was 31·119 in., photographically recorded at Glasgow at 9 a.m., on the 9th. The barometric pressure then gave way, and the region of highest readings moved southwards along our west coast and finally left the South of Ireland on the 15th. Weather throughout the period was mild, an unusual thing, with a very high barometer. At the end of the month a second anti-cyclone spread over the country, when the barometer rose to 30·96 in. at Cork. Reference was made to previous excessively high barometer readings in England and in Siberia, and it was stated that a reading of 31·62 in. at Barnaoul in Siberia, in 1877, was probably the highest ever observed.

Mr. R. Inwards, F.R.A.S., read a paper on "Turner's Representations of Lightning," which he considered to be remarkably true to nature, and demonstrated the same by placing a photograph of Turner's work side by side with a photograph of a real flash of lightning.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 189.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Cloud
	°		°		°	°	°	0-100	°	°	inches		
England, London	74·4	1	26·6	28	54·1	40·5	42·1	84	111·9	24·1	2·84	14	6·
Malta	90·8	27	53·3	20	80·0	65·9	61·4	75	135·1	47·8	1·17	6	4·
Mauritius	82·3	31	65·0	20	79·8	67·6	63·7	75	133·6	54·9	·64	11	5·
Calcutta	91·3	6	67·6	8	85·9	73·3	69·8	73	150·7	60·9	2·79	5	3·6
Bombay	92·6	11	72·8	20	87·7	76·5	74·0	77	144·5	64·9	3·62	7	4·2
Ceylon, Colombo	88·2	19	72·3	...	85·0	74·6	72·0	83	157·0	69·0	30·36	30	8·2
Melbourne	86·6	12	39·1	4	71·1	50·3	47·3	66	136·0	31·0	·57	8	4·9
Adelaide	96·5	19	45·8	3	78·0	53·2	48·0	53	150·3	37·0	·38	8	3·7
Sydney	83·8	18	52·5	30	73·6	57·6	62·0	64	140·0	38·6	·64	10	3·2
Wellington	75·5	29	35·0	1	60·6	48·2	45·2	70	136·0	24·0	4·06	12	4·5
Auckland	69·0	26*a*	44·0	2	62·5	50·3	47·1	71	130·0	40·0	3·79	19	5·0
Jamaica, Kingston	93·5	4	71·4	24	88·0	73·5	71·7	82	...	...	7·21	15	5·4
Trinidad	91·0	4, 18	68·0	5, 21	88·9	71·0	72·9	79	170·0	66·0	10·89	16	...
Grenada	86·4	5	71·0	17	83·8	74·7	71·5	76	157·0	...	5·94	19	3·7
Toronto	65·8	2	23·2	21	51·1	35·1	34·3	72	87·2	17·4	1·04	11	5·6
New Brunswick, Fredericton	70·0	7	14·8	22	51·8	30·7	33·4	71	...	...	1·84	12	4·4
Manitoba, Winnipeg	75·3	12	11·0	28	50·5	26·1	...	...	...	...	·33	7	5·8
British Columbia, Esquimalt	70·1	18	33·2	29	55·9	42·1	45·7	92	...	...	·46	11	5·8

a—and 28.

REMARKS.

MALTA.—Adopted mean temp. 71°·0, 1°·5 above the average. Mean hourly velocity of wind 9·9 miles. Average temp. of sea 74°·6. Thunderstorms on 17th and 18th, and Lightning on 13th, 19th and 22nd. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·2 above, of dew point 1°·9 above, and rainfall 1·04 in. below, their respective averages. Mean hourly velocity of wind 9·8 miles, or 1·5 miles below average; extremes, 27·1 on 7th, and 0·0 on 11th; prevailing direction, E.S.E. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms on the 8th, 9th and 28th. D. G. MANTELL.

Adelaide.—Mean temperature 3°·7 above the average of 38 years, and the highest ever recorded at Adelaide in October. Rainfall 1·52 in. below the average, having only once been less than in the present month. C. TODD, F.R.S.

Sydney.—Mean temperature 2°·3 above, humidity 5·6 below, and rainfall 2·24 in. below, their respective averages. The Colony generally is suffering from a severe drought since March last. H. C. RUSSELL, F.R.S.

Wellington.—Showery from 7th to 9th, otherwise fine up to the night of the 15th, from 15th to 25th wet weather, and the remainder fine. Prevailing winds N.W.; frequently strong. T and L on 25th and 31st. Mean temp. 0°·8 above, and rainfall ·31 in. below, the average. R. B. GORE.

Auckland.—A cool showery month. Mean temp. 1° below the average; rainfall half-an-inch above the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 3·0 miles. Rainfall in Kingston about the average, but in each of the four divisions the fall was about one-third above the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 4·22 in. above the 30 years average. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, FEBRUARY, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall .	·40	XI.	Lake Vyrnwy	1·31
,,	Birchington, Thor	·33	,,	Corwen, Rhug	·65
,,	Hailsham	·33	,,	Carnarvon, Cocksidia ...	1·06
,,	Ryde, Thornbrough	·29	,,	I. of Man, Douglas	2·18
,,	Emsworth, Redlands ...	·46	XII.	Stoneykirk, Ardwell Ho.	1·87
,,	Alton, Ashdell	·55	,,	New Galloway, Glenlee	3·23
III.	Oxford, Magdalen Col..	·31	,,	Lilliesleaf, Riddell	1·48
,,	Banbury, Bloxham	·46	XIII.	N. Esk Res. [Penicuick]	1·95
,,	Northampton, Sedgebrook	·52	,,	Edinburgh, Blacket Pl..	·85
,,	Alconbury	·49	XIV.	Glasgow, Queen's Park..	1·76
,,	Wisbech, Bank House...	·80	XV.	Inverary, Newtown	5·77
IV.	Southend	·68	,,	Oban, The Corran	4·24
,,	Harlow, Sheering..... ...	·50	,,	Islay, Gruinart Schools..	4·20
,,	Colchester, Lexden	·67	XVI.	Dollar.....	1·85
,,	Rendlesham Hall	·38	,,	Balquhidder, Stronvar...	4·00
,,	Diss	...	,,	Ballinluig	·99
,,	Swaffham	·69	,,	Dalnaspidal H.R.S.....	3·30
V.	Salisbury, Alderbury ...	·31	XVII.	Keith H.R.S.....	·89
,,	Bishop's Cannings	·50	,,	Forres H.R.S.	·34
,,	Blandford, Whatcombe .	·52	XVIII.	Fearn, Lower Pitkerrie..	·71
,,	Ashburton, Holne Vic...	1·24	,,	N. Uist, Loch Maddy ...	4·15
,,	Okehampton, Oaklands.	·88	,,	Invergarry.....	4·15
,,	Hartland Abbey	·99	,,	Aviemore H.R.S.	1·01
,,	Lynmouth, Glenthorne.	·62	,,	Loch Ness, Drumnadrochit	1·31
,,	Probus, Lamellyn	·75	XIX.	Invershin	·89
,,	Wellington, The Avenue	·56	,,	Scourie	2·86
,,	Wincanton, Stowell Rec.	·52	,,	Watten H.R.S.....	·76
VI.	Clifton, Pembroke Road	·55	XX.	Dunmanway, Coolkelure	4·91
,,	Ross, The Graig	·24	,,	Cork, Wellesley Terrace	1·70
,,	Wem, Clive Vicarage ...	·52	,,	Killarney, Woodlawn ...	3·08
,,	Cheadle, The Heath Ho.	1·72	,,	Caher, Duneske	1·34
,,	Worcester, Diglis Lock	·23	,,	Ballingarry, Hazelfort...	1·57
,,	Coventry, Coundon	·53	,,	Limerick, Kilcornan ...	1·34
VII.	Ketton Hall [Stamford]	·70	,,	Ennis	...
,,	Grantham, Stainby	·96	,,	Miltown Malbay	2·43
,,	Horncastle, Bucknall ...	·43	XXI.	Gorey, Courtown House	1·88
,,	Worksop, Hodsck Priory	·65	,,	Athlone, Twyford	1·52
VIII.	Neston, Hinderton	1·11	,,	Mullingar, Belvedere ...	1·87
,,	Southport, Hesketh Park	1·03	,,	Longford, Currygrane...	1·93
,,	Broughton-in-Furness ...	4·41	XXII.	Woodlawn	1·67
IX.	Ripon, Mickley.....	·52	,,	Crossmolina, Enniscoe ..	2·08
,,	Melmerby, Baldersby ...	·46	,,	Collooney, Markree Obs.	2·13
,,	Scarborough, Obs.	·57	,,	Ballinamore, Lawderdale	2·62
,,	Middleton, Mickleton ...	1·29	XXIII.	Lough Sheelin, Arley...	1·61
X.	Haltwhistle, Unthank...	1·72	,,	Warrenpoint.....	2·97
,,	Bamburgh	·55	,,	Seaforde.....	1·77
,,	Keswick, The Bank.....	3·27	,,	Belfast, Springfield	2·08
XI.	Llanfrechfa Grange	·65	,,	Bushmills, Dundarave..	2·59
,,	Llandovery	1·23	,,	Stewartstown	2·11
,,	Castle Malgwyn	1·51	,,	Killybegs	3·70
,,	Builth, Abergwesyn Vic.	3·29	,,	Lough Swilly, Carrablagh	3·18
,,	Rhayader, Nantgwillt ...	2·17			

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FEBRUARY, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth.	Date	Days on which ·01 or more fell.	TEMPERATUR Max. Deg.	Date	Min. Deg.	D
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	·30	— 1·58	·08	20	8	56·4	28	23·2	2
II.		Maidstone (Hunton Court)...	·58	— 1·22	·25	21	3	...	...	...	
,,		Strathfield Turgiss	·49	— 1·51	·19	8	11	57·6	28	17·1	2
III.		Hitchin	·37	— 1·38	·07	8	11	54·0	12	18·0	2
,,		Winslow (Addington)	·43	— 1·73	·16	8	8	56·0	12*a*	17·0	2
IV.		Bury St. Edmunds (Westley)	·83	— ·73	·39	29	8	53·0	8, 12	...	
,,		Norwich (Brundall)	·47	...	·21	29	8	56·2	19	25·6	2
V.		Weymouth(LangtonHerring)	·37	— 2·23	·15	8	5	54·0	29	26·0	2
,,		Torquay (Cary Green)	·46	...	·22	8	6	56·4	28	29·0	
,,		Polapit Tamar [Launceston]..	·78	— 2·49	·26	19	9	56·1	10	22·4	2
VI.		Stroud (Upfield)	·37	— 2·19	·15	8	7	54·0	10*b*	25·0	2
,,		ChurchStretton(Woolstaston)	·54	— 1·91	·18	29	8	54·5	28	22·0	2
,,		Tenbury (Orleton)	·40	— 2·08	·14	20	9	58·1	12	24·5	2
VII.		Leicester (Barkby)	·57	— 1·24	·16	20	9	57·0	19	16·0	25
,,		Boston	·67	— 1·01	·25	29	6	55·0	19	22·0	26
,,		Hesley Hall [Tickhill].....	·77	— ·73	·22	28	8	55·0	8	19·0	26
VIII.		Manchester(PlymouthGrove)	1·79	— ·26	·62	29	11	55·0	9	22·0	18
IX.		Wetherby (Ribston Hall) ...	·26	— 1·32	·14	29	2	...	...	...	
,,		Skipton (Arncliffe)	2·03	— 2·66	·73	29	13	...	...	...	
,,		Hull (Pearson Park).	·66	— 1·14	·26	20	8	54·0	8, 9*a*	23·0	26
X.		Newcastle (Town Moor)	·62	— ·78	·31	20	5	...	...	...	
,,		Borrowdale (Seathwaite).....	10·08	— 2·56	3·13	7	16	...	...	...	
XI.	WALES.	Cardiff (Ely).....	1·05	— 2·14	·27	8	16	...	...	...	
,,		Haverfordwest	1·18	— 2·94	·28	8	18	53·1	10	28·0	24*h*
,,		Aberystwith (Gogerddan) ...	1·41	— 1·85	·48	29	10	52·0	10*c*	...	..
,,		Llandudno.....	1·06	— ·86	·38	29	13	58·2	8	26·8	18
XII.		Cargen [Dumfries]	2·20	— 1·45	·52	7	10	53·0	5	24·8	24
,,		Jedburgh (Sunnyside).....	1·06	— ·45	·45	20	7	52·0	7, 8*d*	24·0	19
XIV.		Colmonell	2·60	...	·77	29	14	59·0	11	23·0	20
XV.		Lochgilphead (Kilmory).....	4·85	— ·34	1·17	25	19	...	...	30·0	25
,,		Mull (Quinish).....	4·16	— 1·31	·78	25	18	...	...	...	
XVI.		Loch Leven Sluices	1·30	— 1·45	·30	8	7	...	...	...	
,,		Dundee (Eastern Necropolis)	1·00	— 1·10	·30	20	10	54·8	5	26·4	24
XVII.	SCOTLAND.	Braemar	·83	— 2·53	·20	20	10	50·0	5	26·4	27
,,		Aberdeen (Cranford)	·96	...	·30	20	10	55·0	5, 7	28·0	27
XVIII		Strathconan [Beauly]	1·98	— 2·73	·56	28	12	...	...	...	
,,		Glencarron Lodge.....	7·34	...	2·06	11	17	52·6	7	27·8	19
,,		Cawdor [Nairn] .....e.....	·80	— 1·43	·17	29	12	...	...	...	
XIX.		Dunrobin	1·86	— ·23	·63	25	10	54·0	11	29·0	29
,,		S. Ronaldsay (Roeberry).....	1·86	— ·78	·24	29	18	50·0	10*e*	27·0	28
XX.		Darrynane Abbey.....	3·36	...	·67	25	17	...	...	...	
,,		Waterford (Brook Lodge) ...	2·05	— 2·03	·82	25	10	58·0	12	29·0	4
,,		O'Briensbridge (Ross)	1·25	...	·32	25	12	...	...	...	
XXI.		Carlow (Browne's Hill)	1·38	— 1·70	·57	25	9	...	...	...	
,,		Dublin (FitzWilliam Square)	·87	— 1·48	·32	25	10	56·7	8	31·9	18
XXII.		Ballinasloe	1·63	— 1·15	·62	25	10	52·0	8, 28	29·0	1
,,		Clifden (Kylemore)	5·43	...	1·67	25	12	...	...	...	
XXIII		Waringstown	1·26	— 1·19	·51	25	9	54·0	7*f*	30·0	24
,,		Londonderry (Creggan Res.).	2·82	— ·21	·73	25	12	...	...	...	
,,	IRELAND.	Omagh (Edenfel)	2·18	— ·51	·63	25	11	54·0	11	31·0	17

+Shows that the fall was above the average ; —that it was below it.

a—and 19. *b*—and 12, 28. *c*—and 11, 21, 22. *d*—and 21. *e*—and 11. *f*—and 21, 29. *g*—and 2
h—and 27. *i*—and 26.

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METEOROLOGICAL NOTES ON FEBRUARY, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELD TURGISS.—The weather at first was dry and fair with slight showers at night, and with high temp. right through the middle of the month until the 23rd, when a very sharp but short snap of cold set in which lasted until the 29th. Primroses in flower on 6th, white dead nettle on 9th, lungwort on 29th; honey bee seen on 19th; solar halo on 27th.

ADDINGTON.—Another dry February, making six in the last 11 years with less than an inch of R; whereas during the previous 15 years there was only one similar instance, in 1871. The only sharp frosts were those on the 25th, 26th, and 27th. Dense fog on 6th and 10th, foggy on 11th and 18th.

BURY ST. EDMUNDS, WESTLEY.—A fine dry month with high barometer; a cold spell from 23rd to 27th.

NORWICH, BRUNDALL.—A very dry, mild month. R 1·32 in. deficient. The seventh February out of the last fourteen with less than an inch of rain. How is it that February is proverbially known as "Fill Dyke"?

WEYMOUTH, LANGTON HERRING.—A very calm month. Average temp. at 9 a.m. 39°·4, or 0°·1 above the average of 24 years. A cold snap occurred from the 23rd to the 27th inclusive. Bar. readings very high throughout, except from 19th to 22nd. Fogs on 9th, 10th, 18th, 20th, and 22nd. For the first two months of the year the rainfall is only 1·46 in., or a deficit of more than 70 per cent.

TORQUAY, CARY GREEN.—Rainfall 2·30 in. below the average. Mean temp. 43°·4, or 0°·4 above the average. Duration of sunshine 52 hours 10 minutes, being 30 hours 20 minutes below the average; 9 sunless days.

POLAPIT TAMAR [LAUNCESTON].—Generally calm and bright and very dry, the R being less than a quarter of the average. Slight fog early on 12th. Dense fog on 13th till noon, and on 14th till 10 a.m.

WOOLSTASTON.—A fine and seasonable winter month with frosty nights; very little rain fell till the last day. Mean temp. 39°·5.

TENBURY, ORLETON.—Another very dry month; the fourth February within 10 years with a R of less than half-an-inch. The first 14 days were very warm, but from the 15th to the end of the month the temp. was below the average, with the sharpest spell of frost of the winter from the 23rd to the 27th. The mean temp. of the month was about half-a-degree lower than the average. Fogs on four days, dense on 19th and 21st.

LEICESTER, BARKBY.—Already great deficiency of water. Mean temp. 38°·5.

MANCHESTER, PLYMOUTH GROVE.—Upon the whole, very fine, mild weather for the season. Thick fog on 14th, 15th, and 18th. Mean temp. 40°·5.

WALES.

HAVERFORDWEST.—This month, like January, was remarkable for dampness, mildness, and small rainfall. At times a good deal of wind prevailed, sometimes reaching the force of a moderate gale, and at times there was much fog. From the 17th to 19th the temp. was low at night and again from the 21st to the end, with a bitter easterly wind. E. or S.E. winds prevailed more or less during the month. The quantity of R that fell was very small, but not so small as in 1891 and 1895.

ABERYSTWITH, GOGERDDAN.—Very mild throughout the month, but very little sunshine.

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SCOTLAND.

CARGEN [DUMFRIES].—An uneventful month. The first 16 days were exceptionally warm for the season, the mean temp. of the period being 44°, upwards of 20° higher than that of the corresponding period of 1895. With the exception of a pretty stiff breeze from S. on 7th and 8th the winds were light, westerly and southerly prevailing up to the 16th, northerly and easterly during the remainder. Barometrical pressure was unusually high. Sunshine was registered for only 29 hours, about one-third of the average. Vegetation during the first half made very rapid strides, but received a timely check after the 16th. Pastures very fresh and green.

JEDBURGH.—Up to the 23rd the weather was mild for the season; for the next five days it was cold but dry, with wind from S. or S.E. The barometer throughout was very high. A slight shower of S on the morning of 28th melted almost as it fell. Agricultural work far advanced.

COLMONELL.—Rainfall 1·25 in. below the average of 19 years. Mean temp. 43°·0. About an inch of S fell on 25th.

BRAEMAR.—Mean temp. 39°·0, 17°·7 above that of February, 1895.

ABERDEEN, CRANFORD.—The month was very mild.

S. RONALDSAY, ROEBERRY.—A very fine month until the last week, when southerly gales occurred. Mean temp. 41°·3.

IRELAND.

WATERFORD, BROOK LODGE.—A remarkably mild month, everything very forward. Mean temp. 45°·7.

O'BRIEN'S BRIDGE, ROSS.—A singularly fine month. Abundant sunshine, no frosts, everything forward as at the end of March.

DUBLIN.—A fine, dry, mild, often genial month. A complete contrast to February, 1895, which was the coldest experienced for 40 years. There was neither S nor H, and scarcely any frost in or near Dublin. The mean temp. (45°·2) was not less than 11° above that of February, 1895, while it was also 2°·4 above the average. Absolute drought prevailed from the 9th to the 18th inclusive, and three-eighths of the entire rainfall of the month was measured on the 25th. Foggy on eight days. Amount of cloud (6·6) almost exactly the average. High winds on eight days, but never reaching the force of a gale. Lunar halo on the 25th; faint aurora on the 18th.

OMAGH, EDENFEL.—Like January, the past month was more of a fine autumnal than of a wintry character; many days in their clear soft calmness would have done no discredit to the Riviera. The rain that fell was mostly at night, and frost was only once registered in the screen; a startling contrast to the 27 times of February, 1895.

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UNIV. OF CALIFORNIA

SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCCLXIII.] APRIL, 1896. [PRICE FOURPENCE, or 5s. per ann. post free.

The Rev. Charles Bigman Griffith,

1830–96.

Now that our rainfall and meteorological correspondents number considerably over 3,000, it has become impossible to give obituary notices in these pages of any but those who have done exceptional work; and that certainly was the case with Mr. Griffith.

Although a naturalist and microscopist rather than a physicist, Mr. Griffith was always ready to help in any branch of meteorology, and besides keeping a full record, practically without a break, for a third of a century, he was always ready to undertake any necessary experiments. When Colonel Ward had concluded his observations on the relative indications of rain gauges of different sizes, and of similar sizes at different heights, the whole series was transferred to Strathfield Turgiss, and the little rectory and outbuildings were (as shown in the frontispiece to *British Rainfall*, 1868) appropriated to investigations on the effect of buildings on the amount indicated by gauges in bad positions. Later on he undertook the elaborate experiments upon the relative temperatures shown by thermometers mounted upon various patterns of thermometer stand, the mere recording of which was equivalent to the care of at least half-a-dozen ordinary meteorological stations. Lastly came the experiments upon evaporation with nearly two dozen different patterns, with records of the temperature of the water in each, and also in the river Loddon. The results of the automatic recorder attached to the tank, and the whole of the original observations, were placed in the hands of Mr. Rogers Field, C.E., in 1882 or 1883, but nothing has yet appeared from his pen, though fortunately the chief practical results, and several engravings of the instruments, were given in *British Rainfall*, 1889.

Mr. Griffith was a worker rather than a writer; had he written more, the parallelism between the two Hampshire rectors, Gilbert White of Selborne in the 18th century, and Griffith of Strathfield Turgiss in the 19th, would have been noteworthy.

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GAUGING THE ATMOSPHERE.

WE have just been reading the paper* submitted to the Antwerp Conference by Signor Ventosa, Chief Astronomer at the Madrid Observatory, and wish to couple with a brief notice of it, reference to other somewhat analagous work.

Signor Ventosa has for many years been keeping a record of the direction and amount of the tremors on the edge of the sun, as seen through the large telescope of the Madrid Observatory, and he has tried, by throwing the sun out of focus, to ascertain the differences in the tremors at different heights in the atmosphere—*i.e.*, practically, he has focussed the telescope on layers of the atmosphere at different altitudes, and has obtained remarkably accordant results.—We must refer readers who are interested in the subject to his paper for details of this original and fascinating research.

We intimated above that other men have been labouring on this subject in directions which have much in common.

For years the variation in the scintillation of the stars has been associated with weather changes, and the late M. Montigny devoted much time and care to observations with his "scintillomètre."

Professor C. Zenger, of Prag, has devoted years to the study of small photographs of the sun taken (we believe) out of focus, and has published several works upon the utility of such photographs as indicators of coming weather.

The late Mr. Capron and others have been strong believers in the utility of the study of the Rain-band Spectroscope. And now we have Signor Ventosa's researches.

We should not be surprised if valuable discoveries were made at any observatory where all these methods were carried on at once.

A WET FEBRUARY IN MAURITIUS.

DR. MELDRUM has just sent us a short note as to the unprecedented rainfall in Mauritius in February, 1896.

At the Observatory the average fall for February is 7·15 inches; the total this year was 30·06 inches, or more than four times the average. Between 9 a.m. on February 19th and 10.25 a.m. on February 20th (25½ hours) there fell at the Observatory 17·34 inches.

The monthly totals at stations in the Upland district were equally unprecedented, and reached 40, 50, and even 55 inches.

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* *La direction des vents superieurs déterminée par les ondulations du bord des Astres.* 8vo, Antwerp, 1895.

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ROYAL METEOROLOGICAL SOCIETY.

AT the monthly meeting of this Society on Wednesday evening, March 18th, Mr. E. Mawley (President), in the chair, Mr. Frederic Gaster, F.R.Met.Soc., of the Meteorological Office, delivered a Lecture on "Weather Forecasts and Storm Warnings, how they are prepared and made known," which was illustrated by instruments, diagrams, and numerous lantern slides.

Mr. Gaster said that in the preparation of forecasts, the position held by the barometer was so much more important than that of any other instrument, that its action must be fully comprehended if the rest of the work was to be at all clearly understood. The lecturer having fully explained this, referred to the use of a single isolated instrument, and showed what new light was given to the observer who could have telegraphed to him simultaneous observations from a large number of places scattered over a considerable area of the earth's surface. The variation in the distribution of pressure was dealt with, isobars were drawn, and the phenomena which they exhibit in the way of high and low pressure areas described. An explanation was given of the terms "cyclonic" and "anti-cyclonic," and the generally opposite characteristics of these two systems were stated. Mr. Gaster next drew attention to the obvious importance of the variation in the weather over a given area, caused by alterations in the position of the cyclonic and anticyclonic systems, and the importance of the fact that the former tended to move round the latter from left to right. This led to some remarks on the indications observed when disturbances were advancing towards our islands from different points. Attention was drawn to secondary systems, both of high and of low pressure, the forms they assume, and their effect on the weather which, but for their presence, would probably have accompanied their primaries; and the necessity for allowing for such systems in sending warnings to our coasts. The lecturer then remarked on the value of auxiliary information, such as that of decided changes in the direction of the wind, sudden changes of temperature, the movements of clouds at different levels, observations at high level stations, and telegrams from the United States.

Mr. Gaster next explained how the information is made known to the public. Forecasts are issued by the Meteorological Office in the Daily Weather Report, and also communicated to the Press, &c. Hay harvest forecasts are issued to certain selected authorities who circulate them as much as possible in their neighbourhood. Storm warnings are telegraphed to our coasts with instructions to hoist the cone—point up, when the gale is probable from points between north and east, and point down when from points between south and west. In conclusion, the lecturer drew attention to the marked improvement in these warnings in recent years, and to some of the occurrences which, from time to time, caused failures.

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THE INDEX TO THE METEOROLOGICAL MAGAZINE.

I HAVE had many extremely kind letters respecting the above, but, although greatly obliged thereby, do not think it necessary to print them. As there are 360 numbers, and probably more than 20 entries will have to be made for each, *i.e.*, 7,200 entries, its appearance must not be expected for some months. *British Rainfall*, 1895, must come first, and the final revision of the Index will probably have to take the place of—or accompany—an autumn holiday.

G. J. SYMONS.

THE MILD WINTER.

To the Editor of the Meteorological Magazine.

SIR,—I have been so frequently asked whether the temperature of the past winter has not been unprecedentedly mild, that I give the following statistics to prove that such an impression is unfounded. During the last twenty-one years, there have been six milder winters recorded here, and it may be as well to mention that meteorologists consider the winter season to comprise the period from the first day of December in the one year to the last day of February in the next.

Mean Temperature of Mild Winters.

	1873-4.	1876-7.	1877-8.	1881-2.	1882-3.	1883-4.	1895-6.
Mean Temp....	39°·6	42°·0	39°·3	39°·0	39°·6	40°·0	38°·8
Above Mean...	2°·5	4°·9	2°·2	1°·9	2°·5	2°·9	1°·7

The mean temperature of winter here is 37°·1, so that the winter of 1895–96 has only been 1°·7 warmer than the average. It has been 3°·2 colder than that of 1876–77.

With respect to the rainfall, I may remark that although the amount for December was nearly an inch above the average, yet for January and February it did not amount to one-third of the average for those two months. The total rainfall for the three winter months was 6·20 inches, which is 3·27 inches below the average of 24 years.—I am, yours obediently,

C. LEESON PRINCE.

The Observatory, Crowborough Hill.

To the Editor of the Meteorological Magazine.

SIR,—In 1894 I wrote you (*Met. Mag.*, p. 18), showing reason why "we might expect the first quarter of 1896 or 1897 to have a very high mean temperature"; and I may be permitted (without posing in the mantle of a weather prophet) to refer to this in the light of recent experience. The mean temperature of last quarter, however, apparently falls a little short of 43°. Whether we shall have a fine, hot summer, as in the cases cited in my letter, remains to be seen.

Yours, &c.,

A. B. M.

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THE AMERICAN METEOROLOGICAL JOURNAL.

WE are extremely sorry to hear that this ably conducted periodical will not appear after the present month.

Scarcely anything which money or brains could do, has been spared in order to ensure success, but we believe that from the first the publication has been unprofitable. How much has been lost, and who has borne it, we do not know. On this side of the Atlantic it is generally believed that during its long (12 years) and gallant fight for existence, the bulk of the expense has fallen upon Mr. Laurence Rotch, the founder, proprietor, and director of the Blue Hill Observatory. Of the merit of the twelve volumes of the American Meteorological Journal there cannot be two opinions, and we regret that the United States do not contain a sufficient number of meteorologists to support a monthly periodical.

The only gleam of brightness in the notice which we have received is that arrangements have been made with the editor of *Science* that a portion of that periodical shall be devoted to meteorology, and that Prof. R. de C. Ward, the present editor of the American Meteorological Journal, shall supervise it.

What interesting bits *Science* contains may be judged from the following portion of an article :—

THE METEOROLOGICAL STATIONS IN PERU ESTABLISHED BY HARVARD COLLEGE, U.S.A.

BY R. DE C. WARD.

The meteorological advantages for astronomical work in the region of Peru selected for occupation are very great. The temperature seldom falls below 40°, or rises above 75°. The rainy season is very short, and but little rain falls, generally less than four inches. November marks the beginning of the cloudy season; December is fairly clear, and January to March are cloudy and rainy. During the rest of the year the atmosphere is very dry, and the sky prevailingly clear. In the rainy season it by no means rains every day, there being often a week or a fortnight during which no rain falls. The excessive dryness of the climate, in which vegetation is maintained only by constant irrigation, the short rainy season and the small amount of cloudiness combine to make this a very favourable region for astronomical work.

There are at present eight meteorological stations in Peru, maintained by the Harvard College Observatory. The principal one is at Arequipa, about 80 miles from the coast, and at an altitude of 8,050 feet above the sea. The city itself is situated in a little oasis formed by a river valley at the foot of the Cordillera, a little above the lower-lying desert. At Mollendo, on the sea-coast, there is a meteorological station 85 feet above sea level. Between Mollendo and the main station at Arequipa, another station has been established, at La Joya, about in the centre of a rainless, barren region, and at an elevation of 4,140 feet. The most interesting station of all is that on the summit of the volcano El Misti, 19,200 feet above the sea, lying north-east of Arequipa,

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about ten miles distant. This station, established after much hardship and maintained with considerable difficulty, is now the highest meteorological station in the world. Mr. S. P. Fergusson, of Blue Hill Observatory, Massachusetts, has recently constructed a meteorograph for the Misti, which records automatically temperature, pressure, humidity, and wind direction and velocity, and will run three months without re-winding. The instrument will obviate the necessity of the frequent visits now made to the summit by the observers at Arequipa.

The other stations are as follows: Flank of El Misti, 15,700 feet, about the altitude of Mont Blanc; Alto de los Huesos, 13,400 feet, a high desert plateau east of El Misti; Cuzco, between the eastern and western Andes, 16,100 feet, and Santa Ana, east of the Andes, in the Urubamba Valley, 3,400 feet above the sea.

This continuous line of stations, reaching from the coast inland over 350 miles, and including such great altitudes as the summit and flank of El Misti, is equalled nowhere else in the world, and the results which the data there collected will furnish are certain to be of great importance to meteorology.—*Science*, New York, March 27th, 1896.

EARLY DAMAGE BY LIGHTNING IN 1896.

MARCH 4.—In the evening, a house struck at St. John's, Jersey; chimneys overthrown and broke through the roof.

MARCH 4.—At night, St. Peter's House, Jersey, struck, and also a tree in the grounds. This may have been a multiple stroke, as several parts of the house and outbuildings, including a cow-house, were damaged.

MARCH 16.—About 7.30 a.m., house struck and chimneys demolished at Sunny Bank, Cragg Vale, Mytholmroyd, Yorks.

MARCH 24.—In evening, chimney struck at the "Jordan Arms," New Mills, Derbyshire, but little damage beyond stripping off the plaster.

MARCH 24.—About 9 p.m., a bricklayer, on attempting to open the garden gate of his house, at Northallerton, was struck by L, and his arm scorched.

MARCH 24.—About 3 p.m., an empty house at Mark Quay, Sunderland, struck, and a hole 15 ft. square made in the roof.

MARCH 25.—About 3 p.m. a stack at North Ormesby, near Middlesborough, was struck, and ignited.

MARCH 25.—Chimney of a draper's shop in Union Lane, Gateshead, struck, and knocked through the roof.

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REVIEWS.

Etat actuel de nos connaissances sur l'Hydrométrie du Bassin de la Seine. par GEORGES LEMOINE, Ingénieur en chef des Ponts et Chaussées (Extrait des *Annales de Géographie*). Paris, Armand Collin and Cie, large 8vo, 21 pages, numerous diagrams and large coloured map.

LONDON is still waiting for what M. Belgrand did for Paris in 1854, and until a few more of our legislators appreciate what is understood in France by the expression Hydrométrie, there is little use in repeating that which we have often said, but which the authorities choose to ignore. It is immaterial to us; it is for those who suffer from floods to move, not for us.

This reads like a digression, but is the natural result of perusing the excellent narrative which M. Lemoine has given (in the above paper) of the work to which he has devoted the best years of his life, and which has been rewarded by most gratifying success. So much so, that now, not merely is the height to which every flood in Paris will rise predicted within a few inches, but there is a department under the Minister of Public Works branches of which announce with great precision the floods of the Saone at Chalon, of the Loire at Nevers and Orleans, and of the Garonne at Agen.

There is no one so competent to write upon the subject as M. Belgrand's old colleague and successor, and the paper by its clear expressions and statements, proves how thoroughly M. Lemoine has mastered the subject.

When shall we have any proper records of our British rivers?

Rapporto Annuale dell' Osservatorio Astronomico Meteorologico di Trieste . . . . . per l'anno 1893, redatto da ED. MAZELLE. Vol. X. Trieste, 1896, 4to, 114 pages.

THIS volume which is, we believe, in all respects conformable to the International rules, contains the records for the observatory at Trieste and for four stations in the immediate neighbourhood of that city, and for eight other stations distributed along the eastern shore of the Adriatic for about 300 miles south-east of Trieste, in fact down to the southern extremity of Dalmatia.

We are sorry to see that at several of the stations the rain gauges are on roofs. It seems strange that the inaccuracy of the records of instruments so placed is not generally recognised. At Trieste Observatory the rain gauge is stated to be 87 feet above the ground.

It is a pity that nowhere in the volume is there any comparison of the year to which it is devoted (1893) with previous years—nothing to show whether it was hotter. colder, drier, or wetter, than the average. Of course this could be ascertained by referring to previous volumes, but we think that a few pages devoted to the subject would be an improvement.

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We are rather surprised to see only one temperature exceed 93°, viz., 96°·3, at Punta d'Ostro, on July 2nd. Sharp frosts expected to find, but scarcely a temperature of 17°·8 in Trie and of 5°·9 on the adjacent hills, but those are the records January 14th, 1893.

The rainfall, considering the altitudes of the gauges and that values are for only one year, 1893, are not to be accepted as m than approximate, but the following are the figures :—

Station.	N. Lat.	E. Lon.	Altitude.	Height of Gauge above Ground.	
	° ′	° ′	ft.	ft.	
Punta d'Ostro	42 27 ...	18 34 ...	210 ...	13 ...	9
Ragusa	42 38 ...	18 7 ...	80 ...	36 ...	7
Lissa (Semaphore)	43 5 ...	16 14 ...	79 ...	26 ...	1
Lesina	43 11 ...	16 27 ...	28 ...	15 ...	9
Lussin Grande	44 31 ...	14 30 ...	56 ...	3 ...	4
Lussin Piccolo	44 32 ...	14 28 ...	79 ...	3 ...	3
Pola	44 52 ...	13 51 ...	104 ...	4 ...	2
Fiume	45 19 ...	14 27 ...	16 ...	10 ...	5
Trieste	45 39 ...	13 46 ...	85 ...	87 ...	3
Basovizza	45 39 ...	13 52 ...	1220 ...	5 ...	4
Barcola	45 41 ...	13 45 ...	49 ...	4 ...	3
Opcina	45 41 ...	13 47 ...	1050 ...	6 ...	3

Annuaire pour l'an 1896 *publié par la Société Belge d'Astronom*
Guide de l'amateur Astronome et Météorologiste. Bruxell
Inst. Nat. de Géographie, 1896, small 8vo, 180 pages, numero
woodcuts and six plates.

THE young Belgian Astronomical Society has started boldly l preparing the present volume—which has many good features—f instance, on opening it we find apparently two loose plates, but v speedily find that they are duplicates of two given in the book, ar that these (one of the size of solar spots, and the other a map the moon) are specially intended for separate use.

We have often complained of the absurdity of February beir two days too short while there is an unnecessary number of montl with 31 days, but in this work there is an amusing all round attac on the calendar, summed up as follows :—

(1.) Absence of any definite relation between the days of th week and of the month. The years always begin on different day of the week; even in the same year eac months begins, and *in no regular order*, with a different da of the week.

(2.) No regularity of sequence with months of 30 or 31 days sometimes they alternate, sometimes they are consecutive.

(3.) Unreasonable shortness of February.

(4.) Inconvenience from a business point of view of the frequency with which the 1st and 15th of a month fall on a Sunday

Then the writer takes up M. Armelin's proposal and shows how t get a simplified calendar, with all months of 30 or 31 days, running

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in regular order, and with far less discord between the days of the week and of the month than exists at present.

Pages 51 to 63 contain a series of excellent suggestions as to the mode of observing and recording the magnitude, appearance and grouping of sun spots.

M. Vincent on pages 128–131 gives a short paper on the paths most frequently taken by barometric depressions, and on pages 132–138 he gives a series of instructions for the observation of clouds both as to their form and direction of motion. Lastly, Dr. Stroobant gives instructions for observing and recording the paths of shooting stars.

Sur la période de froid du 27 Janvier au 17 Février, 1895, par A. LANCASTER. [Extr. Bull. de l'Ac. roy de Belgique.] Brussels, 1895. 8vo. 12 pages, 1 map.

WE give a rough translation of the first two sentences of this paper, which will sufficiently indicate its style and nature :—

"We must go back to 1838, or nearly sixty years, to find a period comparable as regards cold with that which we have recently experienced. In 1838 the mean daily minimum from January 8th to 27th was (at Brussels) —13°·4 C (7°·9 F.), and the mean temperature —9°·8 C (14°·3 F.), or 11°·9 C (21°·4 F.) below the average. In 1895, from January 27th to February 17th, or 22 days, the mean minimum was —11°·0 C (12°·2 F.), and the mean temperature —6°·6 C (20°·1 F.), or 10°·1 C (18°·2 F.) below the average."

"The intensity of the cold was generally greater in 1838 than in 1895, but it was twice interrupted by the thermometer rising above freezing point, whereas in January and February, 1895, it remained below that point for 23 consecutive days. No such duration had before been recorded, and it renders the winter of 1894–5 as noteworthy as that of 1837–8."

M. Lancaster then proceeds to give an excellent narrative (with map and tables) of the 1895 frost, which in the high land S.E. of Brussels was very severe. We give the figures in Fahrenheit scale for four stations in that district, also the Brussels and London figures for comparison :—

Period—January 27th to February 17th.

Stations.	Altitude. Feet.	Mean Max.	Mean Min.	Mean of Extremes.	True Mean.	Absolute Min.
Beauplateau ...	1509	20°·5	—2°·9	8°·8	11°·1	—11°·6
Bastogne	1654	22·3	—4·0	9·1	11·5	—16 8
Libramont.....	1575	24·6	0·1	12·4	14·4	—14·8
Carlsbourg.....	1299	23·4	—1·5	10·9	13·1	—11·2
Mean of the above		22·7	—2·1	10·3	12·5	—10·6
Bruxelles		27·1	10·0	18·5	19·8	0·5
London		32·0	18·5	25·2	25·9	7·3
London warmer by		4·9	8·5	6·7	6·1	6·8

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Therefore, much as Londoners grumbled at the frost, it was about 7° worse in Brussels, and about 15° worse on the hills S.E. of that city. Braemar was the only station in the British Isles to approach that district in severity, and Braemar was about 6° warmer.

Annuaire Météorologique pour 1893. Publié par l'Institut Royal Météorologique des Pays-Bas. Forty-fifth year. Utrecht, 1895, oblong 4to, xxxiv–370–xlix pages.

DR. SNELLEN is gradually getting his publication in accord with the rules of the International Committee—but we notice two respects in which we think that he is wrong.—We have often protested against the shortness of February, but until it is rectified by official and international agreement, we think it a mistake to introduce a period adopted by no one else, and to call it February. We are thoroughly with Dr. Snellen in wishing for the alteration, but we are sure that it is not wise to make a change before other civilized nations (or indeed we presume even Holland itself) have legally adopted it. Dr. Snellen's February consists of January 31st, February 1st to 28th, and March 1st. This, of course, gives three consecutive months of thirty days, but it leaves the two halves of the year with 181 and 184 days respectively.

The other practice to which we take exception is one in which we think that he is greatly improving, but he has still some tables in which the year begins with December 1st. We hope that this is the last volume in which we shall see that system adopted.

As regards the volume generally, we have for it nothing but praise. We should, however, like a little information as to the form of instruments used, and the mode of exposure; we note the serious differences of temperature at Utrecht, and the fact that the rain gauge there is 50 feet above the ground; if such can exist at the principal observatory, one becomes suspicious as to the second and third order stations.

There should be a map of the stations.

It would be better to develop the information on page v, by giving the latitude, longitude and altitude of each station.

Sur la distribution a Vienne et a Thorshavn, des éléments météorologiques autour des minima et des maxima barométriques, par A. AKERBLOM [Bihang till K. Svenska Vet.-Akad. Handlingar.] 8vo. Stockholm, 1895. 36 pages.

A CAREFULLY prepared paper, the nature of which is fully indicated by the title. The diagrams are extremely clear. In a short paper at the end upon the "Movements of Cirri over Cyclones and Anticyclones in Central Germany," M. Akerblom calls attention to a fact which we think has never been mentioned or referred to in these pages, viz., that the direction of the upper currents in Germany is independent of disturbances in the lower portions of the atmosphere, *i.e.*, that the cyclonic movements do not reach up to the cirri.

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Klima-Tabeller for Norge. I. Luftens Temperatur af H. MOHN. [Vidensk. Skritter I. Math. naturv. Klasse.] Kristiania, 1895. Large 8vo, 27 pages.

THIS gives an epitome of the best records of the temperature of the air at Norwegian stations, corrected for secular variation and reduced to the mean of the 50 years, 1841-90. by comparison with the fluctuations at Christiania and Vardo. Values are given for 83 stations; of course, we cannot reproduce them all, and, unfortunately, the paper is not accompanied, as it very well might have been, by a map showing the position of the stations, and by a series of isothermal charts. We therefore shall give the values, converted into Fahrenheit's scale for the stations furthest N., E., S. and W. for the highest and lowest station, and for the hottest and coldest.

STATION.	Gjesvær.	Vardo.	Lindesnes.	Helliso.	Jerkin	Holmestrand.	Skudenes	Kontokeino.
Lat. N.	71° 6′	70° 22′	57° 59′	60° 45′	62° 14′	59° 29′	59° 9′	69° 0′
Lon. E.	25 22	31 8	7 3	4 43	9 35	10 19	5 16	23 3
Altitude (ft.)	*23*	*33*	*62*	*62*	*3160*	*10*	*13*	*866*
	°	°	°	°	°	°	°	°
January	25·3	21·9	33·3	36·5	17·2	26·8	35·8	5·9
February ...	24·3	20·8	32·0	35·2	17·2	26·6	34·5	5·5
March	25·9	23·2	34·0	36·0	20·5	30·2	35·8	10·4
April	30·4	28·8	40·5	41·0	27·0	39·7	41·5	20·8
May.....	36·9	34·5	43·0	46·4	36·7	49·6	47·7	35·2
June	44·4	42·1	55·0	52·0	46·8	59·0	53·8	47·1
July.....	50·0	47·5	59·2	55·8	49·5	62·1	57·0	53·4
August	50·7	48·6	59·5	55·8	48·7	60·3	57·9	51·1
September ..	43·9	43·3	54·9	53·4	41·4	52·7	54·3	40·5
October	35·6	34·7	46·9	46·8	31·1	43·2	47·3	25·5
November ...	29·1	27·9	39·6	40·6	21·7	34·0	40·8	13·6
December ...	26·2	24·1	34·9	37·4	17·2	28·2	37·0	6·3
Year	35·2	33·1	44·8	44·8	31·3	42·7	45·3	26·3
Max.	86·0	78·4	77·9	82·0	73·2	—	83·8	80·2
Min.	—3·1	—6·9	2·3	6·4	—21·3	—	5·5	—51·9

. The temperature both monthly and annual for the South-Western stations, Lindesnes, Helliso and Skudenes remarkably resemble the values for Buxton, Derbyshire, as given by Mr. Bayard in *Quar. Jour. R. Met. Soc.*, xviii., 225.

Bulletin Mensuel de l'Observatoire Météorologique de l'Université d'Upsal. Année, 1895, par Dr. H. HILDEBRAND HILDEBRANDSSON. Upsal, small folio, 74 pp., 1895–96.

ANOTHER collection of tables, good in their way, but without a word of introduction, or description of the instruments or of their positions, and without a single figure relative to the relation of the values given in the book to those of previous years.

As this volume deals with 1895, we have taken out the figures for the same period as dealt with by M. Lancaster, and give the summary in exactly the same form as those on page 41—

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Period—January 27th to February 17th, 1895.

Station.	Altitude. Feet.	Mean Max.	Mean Min.	Mean of Extremes.	True Mean.	Absolu Min.
Upsala	...	16°0	.. —0°4	... 7°8	... 9°1	... —19°

This shows that Upsala was about 11° colder than Brussels and about 17° colder than London. It would be a comfort if we could either import some Upsala builders, or send some of ours over there. We should probably hear little afterwards respecting burst waterpipes *et id genus omne.*

Beiträge zur Kentniss des tropischen Regens, von J. Wiesner. [Sitzungsb. d. k. Ak. d. Wissens in Wien]. 8vo, Vienna, 1895, 38 pages.

Herr Wiesner spent part of 1893 and 1894 at Buitenzorg in Java, occupied chiefly with botanical researches, part of which led to his studying the mechanical effect of rain on plants and flowers. As the mean yearly rainfall at Buitenzorg is 176 inches, almost exactly that at The Stye, it was evidently a suitable place for his research.

If, as we presume, Herr Wiesner is a botanist, it is rather strange that he should be, as we think that he is, the first to give us details of tropical rains. Millions of observations of rainfall have been made in the tropics, and yearly means are available for probably 1,000 stations, but for details of hourly or minutely fall, the search would be a weary and nearly profitless one.

Herr Wiesner put up a 12-inch glass funnel to collect the rain and ran it into a calibrated tube, reading off the time by a stop watch, and he also made observations by ascertaining the area of porous paper wetted by respective raindrops. He seems somewhat unhappy at discord between his record and that by the local observer, but as Herr Wiesner took no observations at night, and his "day" began at 6 a.m., agreement would be impossible.

He gives details for nine rains and we extract the heaviest :—

				Total. in.	Rate per hour. in.
(1)	1893.....	Dec. 9.....	2.40 to 2.50 p.m.	0·04	.. ... 0·22
(2)	,, ...	,, 13.....	3.5 to 3.10 p.m.	0·02	..... ·18
(3)	,, ...	,, 16.....	8.57 to 9.2 a.m.	0·07	.... . ·87
(4)	,, ...	,, 23.....	About 3 p.m.	—	..... 1·24
(5)	,, ...	,, 25.....	,, ,, ...	—	..... 3·91
(6)	,, ...	,, 27.....	,, 5 p.m.	—	.. ... ·12
(7)	1894.....	Jan. 6.....	7.12 to 7.24 a.m.	0·03	..... ·29
(8)	,, ...	,, 8.....	7.26 to 7.33 a.m.	0·004	..... ·05
(9)	,, ...	,, 8.....	About noon.....	—	..... 5·36

Unfortunately measurements (4) to (6) and (9) do not give duration, which is all-important; but as far as we can ascertain, none of these measurements approach the intensity observed at Camden Square in 1878, when [*Brit. Rain.*, 1878, p. 79] we had—

Time.	Total. in.	Rate per hour. in.	Time.	Total. in.	Rate per hour. in.
30 seconds ...	·10	... 12·00	3 minutes.....	·40	... 8·00
1 minute	·17	... 10·20	4 ,, ...	·47	... 7·05
2 ,, ...	·32	... 9·60	5 ,, ...	·56	.. 6·72

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SUPPLEMENTARY TABLE OF RAINFALL, MARCH, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall .	3·69	XI.	Lake Vyrnwy	7·62
,,	Birchington, Thor	1·85	,,	Corwen, Rhug	4·41
,,	Hailsham	2·80	,,	Carnarvon, Cocksidia ...	...
,,	Ryde, Thornbrough	3·35	,,	I. of Man, Douglas	4·17
,,	Emsworth, Redlands ...	3·26	XII.	Stoneykirk, Ardwell Ho.	2·84
,,	Alton, Ashdell	4·32	,,	New Galloway, Glenlee	7·85
III.	Oxford, Magdalen Col..	2·32	,,	Lilliesleaf, Riddell	2·56
,,	Banbury, Bloxham	2·32	XIII.	N. Esk Res. [Penicuick]	2·95
,,	Northampton, Sedgebrook	2·70	,,	Edinburgh, Blacket Pl..	1·59
,,	Alconbury	1·98	XIV.	Glasgow, Queen's Park..	4·21
,,	Wisbech, Bank House...	2·57	XV.	Inverary, Newtown	10·22
IV.	Southend	2·62	,,	Oban, The Corran	8·45
,,	Harlow, Sheering..... ...	3·72	,,	Islay, Gruinart Schools..	7·05
,,	Colchester, Lexden	2·77	XVI.	Dollar.....	4·53
,,	Rendlesham Hall	2·82	,,	Balquhidder, Stronvar...	8·79
,,	Diss	...	,,	Ballinluig	2·30
,,	Swaffham	3·73	,,	Dalnaspidal H.R.S.....	6·26
V.	Salisbury, Alderbury ...	3·59	XVII.	Keith H.R.S.....	2·50
,,	Bishop's Cannings	3·58	,,	Forres H.R.S.	...
,,	Blandford, Whatcombe .	3·78	XVIII.	Fearn, Lower Pitkerrie..	1·20
,,	Ashburton, Holne Vic...	8·03	,,	N. Uist, Loch Maddy ...	6·42
,,	Okehampton, Oaklands.	5·45	,,	Invergarry.....	9·01
,,	Hartland Abbey	3·05	,,	Aviemore H.R.S.	3·00
,,	Lynmouth, Glenthorne.	4·83	,,	Loch Ness, Drumnadrochit	3·30
,,	Probus, Lamellyn	3·15	XIX.	Invershin	2·95
,,	Wellington, The Avenue	3·11	,,	Scourie	5·25
,,	Wincanton, Stowell Rec.	3·85	,,	Watten H.R.S.....	2·99
VI.	Clifton, Pembroke Road	3·40	XX.	Dunmanway, Coolkelure	7·00
,,	Ross, The Graig	2·24	,,	Cork, Wellesley Terrace	2·84
,,	Wem, Clive Vicarage ...	2·39	,,	Killarney, Woodlawn ...	6·54
,,	Cheadle, The Heath Ho.	3·94	,,	Caher, Duneske	3·50
,,	Worcester, Diglis Lock	2·31	,,	Ballingarry, Hazelfort...	4·11
,,	Coventry, Coundon	2·26	,,	Limerick, Kilcornan ...	4·54
VII.	Ketton Hall [Stamford]	2·08	,,	Ennis	...
,,	Grantham, Stainby	1·67	,,	Miltown Malbay	6·74
,,	Horncastle, Bucknall ...	2·19	XXI.	Gorey, Courtown House	2·22
,,	Worksop, Hodsock Priory	1·76	,,	Athlone, Twyford	4·69
VIII.	Neston, Hinderton	3·06	,,	Mullingar, Belvedere ...	5·44
,,	Southport, Hesketh Park	3·63	,,	Longford, Currygrane...	4·30
,,	Broughton-in-Furness ...	7·37	XXII.	Woodlawn	4·75
IX.	Ripon, Mickley.....	3·12	,,	Crossmolina, Enniscoe ..	6·90
,,	Melmerby, Baldersby ...	2·41	,,	Collooney, Markree Obs.	5·41
,,	Scarborough, Obs.	2·42	,,	Ballinamore, Lawderdale	6·01
,,	Middleton, Mickleton ...	3·68	XXIII.	Lough Sheelin, Arley...	4·48
X.	Haltwhistle, Unthank...	4·73	,,	Warrenpoint.....	4·53
,,	Bamburgh	1·84	,,	Seaforde..	3·43
,,	Keswick, The Bank.....	7·96	,,	Belfast, Springfield	4·99
XI.	Llanfrechfa Grange	4·33	,,	Bushmills, Dundarave..	3·54
,,	Llandovery	5·40	,,	Stewartstown	3·77
,,	Castle Malgwyn	4·18	,,	Killybegs	8·65
,,	Builth, Abergwesyn Vic.	10·39	,,	Lough Swilly, Carrablagh	6·22
,,	Rhayader, Nantgwillt ...	8·00			

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MARCH, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours Dpth	Greatest Fall in 24 hours Date	Days on which '01 or more fell.	TEMPE Max. Deg.	Max. Date
			inches.	inches.	in.				
I.		London (Camden Square) ...	3·20	+ 1·59	·53	17	25	65·2	22
II.		Maidstone (Hunton Court)...	2·11	+ ·61	·41	7	10	...	...
,,		Strathfield Turgiss	...	...	...	...	...	...	...
III.		Hitchin	3·08	+ 1·74	·46	20	28	63·0	22
,,		Winslow (Addington)	2·50	+ ·78	·50	17	26	64·0	22*a*
IV.		Bury St. Edmunds (Westley)	3·78	+ 2·23	·64	17	26	60·0	22
,,		Norwich (Brundall)	3·02	...	·55	28	26	65·6	22
V.		Weymouth(LangtonHerring)	2·72	+ ·82	·66	17	26	59·0	22
,,		Torquay (Cary Green)	3·42	...	·62	20	23	57·1	11
,,		Polapit Tamar [Launceston]..	4·69	+ 2·16	·91	7	23	58·0	23
VI.	ENGLAND.	Stroud (Upfield)	2·71	+ ·52	·33	2, 17	23	62·0	24
,,		ChurchStretton(Woolstaston)	3·09	+ ·96	·41	2	24	61·0	24
,,		Tenbury (Orleton)	3·12	+ 1·04	·61	20	23	63·0	24
VII.		Leicester (Barkby)	2·03	+ ·32	·30	7	28	65·0	24
,,		Boston	1·98	+ ·44	·30	20*h*	18	65·0	23
,,		Hesley Hall [Tickhill].....	1·55	— ·35	·33	13	16	67·0	27
VIII.		Manchester(PlymouthGrove)	3·89	+ 1·67	·76	7	23	59·0	24
IX.		Wetherby (Ribston Hall) ...	2·37	+ ·31	·53	13	11	...	...
,,		Skipton (Arncliffe)	9·87	+ 4·77	1·44	2	24	..	...
,,		Hull (Pearson Park).	2·40	+ ·35	·75	13	20	65·0	25
X.		Newcastle (Town Moor)	2·45	— ·18	·90	13	16	...	...
,,		Borrowdale (Seathwaite).....	19·28	+ 8·78	2·07	2	24	...	...
XI.		Cardiff (Ely).....	5·25	+ 2·27	·65	7	28	...	...
,,	WALES.	Haverfordwest	3·62	+ ·38	·49	6	29	55·7	25
,,		Aberystwith (Gogerddan) ...	5·85	+ 2·87	1·82	7	27	60·0	24
,,		Llandudno.....	4·11	+ 2·03	·83	7	23	55·5	17
XII.		Cargen [Dumfries]	4·56	+ 1·26	·64	2	19	55·0	25
,,		Jedburgh (Sunnyside).....	2·70	+ ·74	·50	21	14	59·0	25
XIV.		Colmonell	5·03	...	·64	7	22	59·0	22*b*
XV.		Lochgilphead (Kilmory).....	8·78	+ 4·32	1·25	7	28	...	...
,,	SCOTLAND.	Mull (Quinish).....	7·47	+ 3·63	·85	7	27	...	...
XVI.		Loch Leven Sluices	2·90	— ·07	·50	3, 4	15	...	...
,,		Dundee (Eastern Necropolis)	1·15	— 1·25	·20	15	16	57·0	31
XVII.		Braemar	2·33	— ·31	·32	19	20	54·1	25
,,		Aberdeen (Cranford)	2·30	...	·40	7	23	58·0	31
XVIII		Strathconan [Beauly]	8·10	+ 3·78	1·54	2	18	...	...
,,		Glencarron Lodge.....	11·79	...	1·15	24	28	54·0	25
,,		Cawdor [Nairn]	2·22	+ ·18	·37	5	17	...	...
XIX.		Dunrobin	2·82	+ ·57	·42	10	21	56·0	31
,,		S. Ronaldsay (Roeberry).....	3·09	+ ·55	·37	15	24	53·0	25
XX.		Darrynane Abbey.....	5·58	...	·70	3	29	...	...
,,		Waterford (Brook Lodge) ...	2·36	— ·54	·25	26	24	58·0	7*c*
,,		O'Briensbridge (Ross)	5·01	...	·51	7	22	..	...
XXI.	IRELAND.	Carlow (Browne's Hill)	...	...	..	..	...	...	..
,,		Dublin (FitzWilliam Square)	3·31	+ 1·30	·50	17	23	58·5	24
XXII.		Ballinasloe	4·37	+ 1·74	·59	3	28	55·0	9, 24
,,		Clifden (Kylemore)	9·76	...	1·39	23	30	...	...
XXIII		Waringstown	3·42	+ 1·07	·45	2	23	60·0	24*b*
,,		Londonderry (Creggan Res.).	5·32	+ 2·59	·68	3	27	...	...
,,		Omagh (Edenfel)	4·33	+ 1·85	·66	7	26	54·0	8, 22

+Shows that the fall was above the average ; —that it was below it.

a—and 24. *b*—and 25. *c*—and 8, 11, 22. *d*—and 18, 29. *e*—and 30. *f*—and 29, 30. *h*—and 29. *i*—and 26.

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METEOROLOGICAL NOTES ON MARCH, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

HITCHIN.—The wettest March since 1851, with the greatest number of wet days ever recorded.

ADDINGTON.—The rainfall has been only twice exceeded during 25 years, and no other March has had rain on so many days. On the 4th the bar. was unusually low, 28·783 in. (cor. and red.) at 9 a.m. Dense fog on the morning of 23rd. S showers and L on 3rd. T on 22nd. H, S and sleet on 28th and 29th.

BURY ST. EDMUNDS, WESTLEY.—The wettest month of March registered since observations commenced on January 1st, 1857. March, 1888, 3·35 in. and March, 1890, 3·06 in. are the only other instances with more than three inches. A mild month. Vegetation very forward. T on 4th. T S on 22nd.

NORWICH, BRUNDALL.—The mildest March since 1882, and the wettest since 1888, when the month's total was nearly the same. At the close of the month vegetation was not so forward as in 1882, when there was more sunshine. S.W. gales on 3rd, 6th and 16th, and N.W. on 27th. H on 4th, 5th, 16th and 29th. Severe but distant T S on evening of 22nd. Slight distant T S on evening of 24th. Solar halo on 26th.

WEYMOUTH, LANGTON HERRING.—The mean temp. at 9 a.m., 46°·2, is the highest of the last 25 Marches, and 4°·6 above the average. Very strong gales blew on the 2nd, 3rd and 4th, and again on the 26th. Solo halos were observed on the 10th and 26th. Fogs on the 7th and 17th. Rainfall of the first 3 months of the year 4·18 in., or 61 per cent. of the average.

TORQUAY, CARY GREEN.—Rainfall 1·05 in. above the average. Mean temp. 47°·8, or 4°·1 above the average. Duration of sunshine 117 hours 20 minutes, being 32 hours below the average; 3 sunless days.

POLAPIT TAMAR [LAUNCESTON].—Generaly warm, but rough and stormy, and unusually free from cold east winds. A very wet month, the total being the highest for March during 16 years, the previous highest being in 1888, when 4·53 in. fell. H, S and T on 3rd. H on 4th. Thick fog early on 23rd. Stormy with H on 26th, 27th and 28th.

STROUD, UPFIELD.—T and L between 4 and 5 a.m. on 2nd; L seen at 6 p.m. on 24th. S.W. gales on 3rd, 14th and 26th.; N.W. gale on 15th. Slight S shower on 29th.

WOOLSTASTON.—A stormy month, with constant scuds of S and H; a wild gale on the night of the 2nd. Mean temp. 44°·4.

TENBURY, ORLETON.—A very warm, damp month. The warmest March, with the exception of 1868, in the last 35 years, and the wettest since 1886. Mean temp. nearly 4° above the average. Chiffchaff heard on the 19th. Cherry, plum and damson trees coming into blossom at the end of the month. S on the 13th and 16th. T and L on 24th. Aurora borealis on the 4th.

LEICESTER, BARKBY.—Considerable wind at times. R every day but three. Mean temp. 43°·1.

MANCHESTER, PLYMOUTH GROVE.—Very mild for the season, and no cold easterly winds. The rainfall is the greatest in March for 29 years. Thick fog on 23rd and 25th. On the 24th a beautiful display of sheet lightning. On the 28th a slight fall of S. Mean temp. 45°.

WALES.

HAVERFORDWEST.—Another month of constant R, although the quantities were small. The month commenced with boisterous weather and heavy gales, with the barometer below 29 inches for more than 36 hours, the gale lasting a week. The month throughout was mild for March, with only one night of frost

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in the screen. The last week was very stormy and colder; the last two days calm and fine. Blackthorn in full blossom, chestnut almost in full leaf, hedgerows quite green. Trees of every kind very forward; every appearance of a very early spring.

ABERYSTWITH, GOGERDDAN.—Very wet throughout the month and very mild, but very little sunshine.

SCOTLAND.

CARGEN [DUMFRIES].—Constant atmospheric changes have been the order of the month, but cloudy unsettled weather generally prevailed. Bar. pressure has been very fluctuating, and the mean for the month 29·556 in. has only in four years been lower since 1860. Temp. is 1°·6 above the average, the lowest reading 28° being the highest minimum in this month since 1882, when frost was never registered. L was seen on the night of 3rd; an inch of S fell on 14th; brilliant aurora was seen on 29th. Westerly wind prevailed on 17 days, and a pretty stiff breeze from N.W. was experienced on 6th. The wet weather delayed the sowing of corn until the last two days of the month, but farm work generally is well advanced. Vegetation is very forward pastures looking exceptionally fresh and green.

JEDBURGH.—The weather was on the whole agreeable. The night temp. was low but that of the day was high. Though a good deal of R fell there was much wind which kept the ground dry and made it fit for sowing. S on the 13th, H T and L on 21st.

COLMONELL.—Mean temp. 44°·1. S showers on 3rd. Strong gale on 16th.

LOCHGILPHEAD, KILMORY.—An exceptionally wet and stormy month for March.

MULL, QUINISH.—An excessively wet and unsettled month the R being almost double the average. Frost on the 12th and 14th, but not severe. Vegetation unusually forward.

BRAEMAR.—A very excellent month. Duration of sunshine 130 hours 20 minutes.

ABERDEEN, CRANFORD.—The month was very dull and cold.

S. RONALDSAY, ROEBERRY.—A wet cold month, Mean temp. 41°·4. A beautiful display of Aurora on the evening of 4th, finest between 10 and 11 o'clock.

IRELAND.

DARRYNANE ABBEY.—A wet cold month, the wettest March registered between 1870–79 and 1890–96. The next wettest was March 1877, when 4·81 in. fell on 22 days.

WATERFORD, BROOK LODGE.—Laurels and blackthorn had a remarkable amount of blossom on them this season. The frost on the 18th and 19th injured the early potatoes which were very forward. H on 1st and 28th, S on 3rd. Thick frosty fog on 22nd.

O'BRIENSBRIDGE, ROSS.—A bad month and the heaviest R since 1882 when 5·76 in. fell.

DUBLIN.—A changeable, wild and very rainy month. Temp. although on the whole markedly above the average was very unstable, and some sharp fluctuations were observed. The mean temp. 46°·1 is 3°·0 above the average. The atmosphere was more or less foggy on 6 days. High winds were noted on 17 days reaching the force of a gale on 10 occasions, S or sleet occurred on 3 days and H fell on 4 days. A solar halo was seen on the 27th and a lunar halo on the 23rd. Brilliant aurora borealis occurred on the night of the 4th.

WARINGSTOWN.—*Correction for February.* In the return for last month ·15 in. measured on March 1st was omitted, leap year being forgotten. The total R should be 1·41 in. and difference from average −1·04.

OMAGH, EDENFEL.—The wettest March since 1868. Let us hope that it will be equally prophetic of the splendid year that then followed.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXIV.] MAY, 1896. [PRICE FOURPENCE. or 5s. per ann. post free.

THE WORST GALE OF THE 19TH CENTURY IN THE ENGLISH MIDLANDS.

IT is remarkable that the gale of March 24th, 1895, has not been completely discussed. Short papers were written respecting it for local scientific societies in Northamptonshire and Norfolk by the Rev. H. A. Boys and Mr. A. W. Preston respectively, and the same gentlemen sent very graphic letters, which, with one from Miss Stanton, of Stroud, were printed in this Magazine for April, 1895; but there is not, to our knowledge, any full record of it in the publications either of the Meteorological Office or of the Royal Meteorological Society.

In preparing the observers' notes for publication in *British Rainfall*, 1895, our attention was recalled to the subject, and we hesitated for a moment and considered whether the additional unutilized data which we possessed should be inserted in that volume, but as it was a storm of wind, not rain, it appeared more appropriate to print it in these pages. We therefore give in the present number part of a list of damage which we believe to be without parallel since 1703, and in the next number we hope to complete it, and to offer some general remarks upon the subject.

It is a curious coincidence that the day of the week, as well as the day of the year were identical with that of the disaster to the "Eurydice,"* and the hour of the day approximately the same:—

"Eurydice,"	Midland Gale,
Sunday, March 24th, 1878.	Sunday, March 24th, 1895.

Counties arranged as in *British Rainfall*, places grouped from South to North.

MIDDLESEX.

James Street, Commercial Road, E.—Some houses had been partly pulled down, an outside wall was blown over and killed three persons.

Hyde Park, London.—A large oak blown over about 4 p.m.

Earl's Court.—Several erections damaged.

* *Met. Mag.*, 1878, pp. 33, 57.

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MIDDLESEX—(*continued*).

Tottenham Court Road.—A shop window at the corner of Chenies Stre wrecked. The glass fell outwards, and as the window faced W.S.W looks much like the result of expansion of the air in the shop.

Alperton, Harrow.—A man was blown under a passing vehicle and kil

BERKS.

Windsor.—Six large elms blown down in the park.

BUCKS.

Newport Pagnell.—Three pinnacles blown off the church tower, one p the roof of the nave, and rendered it impossible to hold service. Tree chimneys have suffered severely.

OXFORD.

Banbury.—Chimney blown down and woman killed.

NORTHAMPTON.*

Easton Neston.—Fearful gale, 2 p.m.

Blisworth—Terrific hurricane, 0.30 to 2.30 p.m.

Fawsley.—Between 1.30 and 2 p.m., thousands of trees, chiefly elms, up by roots or snapped off.

Easton Mauduit.—Dangerous hurricane from 1.30 to 2.15 p.m. The worst from 1.50 to 2 p.m.

Northampton.—A child killed by a falling wall; many roofs damaged, t churches and five chapels injured.

Althorp House—Terrific gale between 1 and 2 p.m., especially just be 2 p.m. The gale lifted the lead of the roof over two of the high chimneys

Boughton House.—About 1,000 trees down.

West Haddon.—Violent hurricane between noon and 3 p.m.

Wellingborough.—The lowest estimate for the damage in this town is £5, The bell turret at St. Barnabas blown on to the schoolroom, the Waterwo chimney and that of Messrs. Dulley, each about 40 ft. high, were blown do and there was damage in nearly every street. In the fens, hardly a st stack is left.

Hargrave.—Phenomenal hurricane, 1.30 to 2.30 p.m.

Raunds.—The streets were strewn with thatch, slates, ridge-tiles chimney pots; a window was blown in at the Post Office, and the woo pavilion in the cricket field was blown to atoms.

Kettering.—During the gale, about 2 p.m., the town was a veritable pan monium, the streets being thickly strewn with tiles and chimney pots. factory chimney was blown down, and a horse buried in its stable. T neighbourhood is thickly wooded, and has suffered tremendously; at *Wark* alone, 200 trees were down. All the roads out of the town were impassable account of fallen trees.

Thrapstone.—Much damage to houses and trees.

Welford.—Gale at its height from 1 to 3 p.m.

Aldwincle.—Gale at its height from 1.30 to 3 p.m.

* See *Met. Mag.*, April, 1895.

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NORTHAMPTON—(*continued.*)

Oundle.—The damage is enormous; nearly every house suffered, and the streets were littered with wreckage from end to end. Six large chimneys (including that at the gas works) went down about 2 p.m., and unnumbered private ones. The roof of the cricket club pavilion was carried into an adjoining field. At *Polebrooke*, the top of the spire, and the weathercock fell through the roof into the church.

Weldon.—Full force of gale from 1.45 to 2.15 p.m.

Deene, Kingscliffe.—Hundreds of trees uprooted, and many houses damaged.

Apethorpe, Wansford.—Considerable damage to trees, ricks, and thatched cottages.

Kingscliffe.—Many chimneys down, in fact, few houses in the place entirely escaped.

Peterborough.—Few cities suffered more than Peterborough; the gale was heaviest shortly before 2 p.m. and began to subside about 3. Three pinnacles on the west front of the cathedral were blown down, and the roof was considerably damaged. The Deanery has a particularly wrecked appearance, the two chimney stacks on the wing nearest the cathedral both going down, and one of them taking part of the gable with it. A pinnacle was taken off St. John's Church, one window was blown in at Christ Church, and one at the Baptist Chapel. Several factory chimneys were overturned, but the special feature at Peterborough was the wreckage of private houses, not mere damage to roofs by the falling of chimney stacks, but the frequency with which gable ends were forced in or out, and the consequent wreckage of furniture; *e.g.*, in Gladstone Street a house had only the ground floor intact, and after the roof and wall of the front bedroom had gone, the wind blew a large wardrobe into the street. A wood and iron stable in the rear of Mrs. Bird's residence, on the London Road, was lifted up, and carried bodily into the grounds of Councillor Crawley's house, and then the wind ripped off the side and tore it into pieces.

Milton Park, Peterborough.—Between 300 and 400 trees blown down.

Eye.—A very large portion of the roof of the church was blown off; at least 50 houses were damaged, several gable ends were blown in; it was the fiercest gale remembered.

Easton.—Several houses unroofed, and the rectory and the Wesleyan Chapel each lost a chimney.

Barnack.—Nearly every house damaged and many hundred trees uprooted, one in falling killed a pony.

HUNTINGDON.

St. Ives.—Great damage about 2.30 p.m.

Godmanchester.—Scarcely a house or building escaped damage, the gable of the old Grammar School fell outwards; the damage is estimated at hundreds of pounds.

Huntingdon.—Six boys were standing under the shelter of a fence watching the tiles being stripped off the houses, when an elm tree was blown on to them, which killed one and broke the legs or arms of all the others. Nearly every house in the town was damaged, a finial was blown off the church and a tower window blown in. The roads out of the town were all blocked by fallen trees. *Buckden* church spire was blown down.

Ramsey.—Scarcely a house has escaped damage. Many chimneys and stacks overturned, and the roof of the waiting room at the railway station carried away.

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CAMBRIDGE.

Cambridge.—About 2 p.m., chimney damaged in St. Andrew's Street. Church, Newmarket Road, partly unroofed. About 2.10 p.m., a ch stack was blown over at *The Spring, Chesterton.* About 2.20 p.m., tl 30 feet of a brewery chimney was blown down. At 2.30 p.m., a chimne blown down in York Street. About 2.50 p.m., the Sturton Town Ha partly demolished.

Bottisham.—Many gables and chimneys, and scores of trees, blown between 1 and 3 p.m.

Swaffham Bulbeck.—Great damage about 2.15 p.m.

Swaffham Prior.—Windmill smashed between 2.30 and 3.20 p.m.

Newmarket.—Great damage, especially to tall chimneys and to trees.

Waterbeach.—Great damage between 2 and 4 p.m.

Cottenham.—Unprecedented gale from 2 to 3.15 p.m., very few buil escaped damage.

Willingham.—Nearly every building damaged between 2 and 3 p.m.

Soham.—No one remembers such a gale as occurred between 2 and 3 The principal street was covered with shutters, slates, tiles, and thatch; pinnacle of the church fell through the roof into the nave, smashing a s several cottages had one end blown out, while barns and windmills went d in all directions.

Haddenham.—Great damage between 2.15 and 4 p.m., five barns comple wrecked.

Witchford.—One barn was turned over bodily, others lost their roofs, about 150 feet of tiling was stripped off the church.

Ely.—Terrific gale, 2 to 3.30 p.m., the cathedral did not suffer seriou though lead on the roof was rolled up, several windows were broken, an pinnacle was overturned. The workhouse, brewery, and several private hou much damaged.

Chatteris.—Terrific storm from 2.15 to 3.30 p.m. Most of the large chimn are down, also a new factory 150 feet long, and the turrets of each of t cemetery chapels, while hovels and sheds are down by the score. The soil v blown up from the Acre Fen in tremendous clouds, having the appearance black smoke from a gigantic fire. Tons of straw are floating down the river such masses as to impede navigation.

Littleport.—Much damage to chimneys and roofs.

Manea.—Great storm between 2 and 3.15 p.m.

Benwick.—The air was so filled with black earth that one could only see few yards. The church, chapel, and school were all damaged.

Wimblington, March.—Church much damaged in afternoon.

March.—A terrific gale passed between 2 and 3 p.m.; the streets we covered with broken tiles, and hardly a house escaped. Seven railway carriag were on one siding, and one truck on another, both sets were blown along to th points, where a collision occurred. Baptist Chapel blown down and th Wesleyan one much damaged.

Whittlesea.—Serious destruction, every third or fourth house damaged.

Wisbech.—Very great damage, scarcely a house escaped. There is supposed to have been no such gale since 1703; its intensity did not last half-an-hour and was between 2.10 and 3 p.m.

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ESSEX.

Coggeshall.—Cottage damaged by the fall of a large poplar across it.

SUFFOLK.

Lowestoft.—The windows of two shops were blown in, houses were unroofed and trees blown down. To enumerate all the damage would be to give a list of one-third of the houses in the town.

Bury St. Edmunds.—Two chimneys blown over at the hospital, about 3 p.m., and several pinnacles off the church.

NORFOLK.*

Denver.—Church very seriously damaged, the spire having fallen through the roof.

Yarmouth.—Much damage to house property, several houses unroofed, and the tramroads so blocked by fallen trees that traffic was suspended. The Parish Church, Post Office and Customs House are all damaged. The scene in Middlegate Street was remarkable, there are about 200 houses, and scarcely one had escaped injury, and there was hardly a square foot in the street not covered by some kind of wrekage. At 3.40 p.m., a roll of lead was blown across S. Howard Street, at about 25 ft. above the ground, it struck and demolished an upper window, and then fell back on to the pavement below. At Messrs. Brown's Yards, slates from neighbouring houses were imbedded an inch deep in the doors.

Norwich.—Part of Norwich Workhouse, consisted of three stories: (1) a basement; (2) the dining hall; (3) the chapel. The master, during the gale, was watching the roof, and saw it lifted bodily about 4 ft. and then dropped, when it crashed through the chapel carrying the floor of it, and of the dining room, into the basement, thus wrecking the entire building. In *Mill Hill Road*, the roofs of two cottages with the rafters and tiles thereon were carried across the road (more than 30 ft.). In *College Road* there was a stack of timber in readiness for house building, nearly the whole stack (in 12 ft. and 16 ft. lengths) was swept up into the air and carried over the Unthanks Road allotments.

St. Faith's (Norwich).—Scarcely a house for miles round escaped damage, the trees were down in all directions, and nearly every rick was either stripped of its thatch or blown away entirely. It is estimated that the Abbey Farm lost 6,000 tiles.

Lakenham.—Roads strewn with tiles and broken trees, walls and gates blown down, and roofs stripped and broken.

Thorpe Hamlet.—Terrible havoc; one little street (Harbour Road) was so strewn with tiles that it looked as if paved with them.

North Heigham.—This district suffered terribly, the whole place looked as if it had been bombarded, tiles, slates and brick ends were lying about in cartloads, the gables of several houses fell out, and scores were unroofed.

Acle.—Many houses, and also the church, damaged, and ricks blown away.

Lower Hellesdon.—Just before afternoon service, a tree was blown across the road which barred access to the church; this was sawn up and service commenced, but in a few minutes there was so much noise from falling slates, gutters, coping stones and broken windows that all had to leave. The roof of Sir H. Bullard's malthouse was lifted bodily and dropped on the ground below.

* See *Met. Mag.*, April, 1895.

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NORFOLK—(*continued*).

Swaffham.—Nearly every house suffered severely. The chimney shaft of the brewery fell across the premises, and destroyed about 2,000 gallons of beer.

Walsoken.—Hardly a house escaped, and many fruit trees were uprooted.

South Walsham.—Furious gale from W.S.W. 3 to 3.30 p.m.; although the trees were without leaves, very large numbers were overthrown, and many houses and ricks damaged.

Beeston.—Between here and *Sprowston* the road was strewn with hay, pedestrians reported it to be in places knee deep.

E. Dereham.—Great damage to roofs and chimneys about 3 p.m., one thatched roof entirely carried away.

Worstead.—A window of the church blown in during afternoon service.

North Walsham.—Hundreds of trees blown down, ricks and chimney stacks overturned, the church steeple damaged and lead ripped off the roof. The gas holder (capacity 35,000 cubic feet) at the Gas Works, which was about half full, was so blown to one side that the pillars were drawn nearly off their brick bases, and the whole apparatus will have to be taken down and re-erected.

Lynn.—The damage is estimated at several thousand pounds, nearly every building has suffered. Several factory chimneys are down, nearly all the roof has gone off the Corn Exchange. 3,000 trees reported to be down on the *Castle Rising Estate.*

Sandringham.—Nearly 2,000 trees blown down, also about 30 yards of the garden wall.

Wells.—Many trees down, and the streets strewn with tiles and chimney pots.

SOMERSET.

Bath.—St. Michael's and St. Bartholomew's Churches both damaged, soon after 1 p.m., as well as many private residences.

GLOUCESTER.

Bristol.—Trees blown down, attic windows blown in, tiles and chimney stacks blown into the streets, and two children killed. The police cautioned persons against attempting to cross Princes Street Bridge, a four-wheel cab attempted it, and was blown over. The wind actually lifted the heavy planks in the timber yards and whirled them in the air, carrying some of them a considerable distance. The storm was worst about 0.45 p.m.

Gloucester.—Trees uprooted, roofs blown off, a wall blown out at a chapel, and a tall chimney blown down at the marble works.

HEREFORD.

Whitbourne (near *Worcester*).—An iron mission room was so forced out of shape that it could not be used.

SHROPSHIRE.

Bridgnorth.—Many houses unroofed, and hundreds of trees uprooted.

Stirchley, Coalport.—Church seriously damaged.

Ironbridge.—Part of the roof of the Wesleyan Chapel was blown in, and fell upon the organ, two windows were blown out at the minister's house; many ordinary chimneys were blown down, and two tall ones at the brick works.

Newport.—Two large chimney stacks blown over, each fell through the roof into the rooms below.

STAFFORDSHIRE.

Handsworth.—Top of spire at the Baptist Church blown off.

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STAFFORDSHIRE—*(continued)*.

Bilston.—The Town Hall roof, and the G. W. R. station, considerably damaged, as was also much small property.

Wolverhampton.—St. Peter's Church lost three out of its four pinnacles, and many factory and private chimneys demolished. The total damage was put at £15,000.

Walsall.—Two stacks of chimneys upset at the hospital; one fell across a ward and brought down the whole building, carrying the patients and nurses into the board room below. Very serious injury and suffering resulted.

Tamworth.—Great destruction of trees south of this town. Roads blocked.

Lichfield.—Part of the parapet of the Lady chapel was blown down, and the roof of the cathedral stripped of an unusual number of slates. Many houses suffered either by broken roofs or overturned chimneys.

WORCESTERSHIRE.

Spetchley Park, Worcester.—Nearly 50 large elms overturned, and the contents of several stackyards in the neighbourhood scattered.

Worcester.—The roof of a tannery was lifted bodily, a pinnacle was blown off the cathedral, and much damage done to private property.

Droitwich.—The mischief here was chiefly among the trees, hundreds of which have fallen. The borough surveyor, with men and horses, were occupied all the afternoon removing seven large trees which had fallen across roads in the borough. Some damage was done to the roof of St. Augustine's Church.

Headless Cross, Tardebigge.—Wesleyan Chapel completely wrecked.

Bromsgrove.—All Saints' Church lost a pinnacle, which damaged the roof; several of the crest tiles were also carried away. The storm was worst about 1.15 p.m., and many chimney stacks fell and broke through the roofs into the upper rooms. A hayrick has disappeared, it is supposed to have gone into an adjacent pool. Every road was blocked by fallen trees, but by Monday the main roads were cleared.

WARWICKSHIRE.

Sutton Coldfield.—The Parish Church, Congregational Church and Wesleyan Chapel were all damaged; many trees were down, and two roofs damaged by the fall of chimney stacks.

Stratford-on-Avon.—Nearly all the roads blocked by prostrate trees, and roofs damaged in all parts of the town. Roof of goods shed at railway station lifted off.

Henley-in-Arden.—Dozens of trees uprooted, and several roofs damaged by falling chimney stacks.

Warwick.—The Gateway Chapel was much injured, also two houses in Market Square, and several in *Coten End* and *Emscote.*

Leamington.—Chimney stack overturned and broke through two floors to the dining room, where it injured three ladies; they were taken to the hospital, where a similar but less serious accident had occurred.

Kenilworth.—Hundreds of trees uprooted, the bell turret at the National Schools, and a wall at the Abbey Hotel upset.

Rugby.—Hundreds of trees down, including 17 in the School Close.

Coventry.—Many trees uprooted, and the advertisement hoardings carried away.

Bedworth.—Innumerable trees uprooted, a wooden shed about 180 feet by

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WARWICKSHIRE—(*continued*).

20 feet was blown over, and a house in King Street destroyed; a window was blown in in High Street, and several walls and stacks were overthrown.

Birmingham.—The worst of the storm was between 1.30 and 1.45 p.m., and the number of houses of which the upper rooms were wrecked by falling chimneys is past all counting; every 100 yards in any street will prove it, and it will be weeks before all can be repaired. Happily very few persons were in the streets, and most were at dinner downstairs, hence only three deaths have to be recorded, but there were a great many serious wounds. St. Lawrence's Church much damaged.

LEICESTERSHIRE.

Market Harborough.—Much damage in this neighbourhood. The worst case was the residence of Mr. Kennard, on high ground, at *Clack Hill.* The family was at luncheon when the window and surrounding framework was blown in, and they were battling with it, when a great crash told that a double Elizabethan chimney had broken through the roof and wrecked two bedrooms.

Leire.—Many trees down and three cows killed beneath them, several houses unroofed.

Frolesworth.—Farm buildings demolished, and many trees down.

Dunton Bassett, Lutterworth.—Much damage to trees, and at the new vicarage, of which the chimneys had been made the decorative feature, every one was blown over, and broke through the roof.

Broughton Astley.—A perfect tornado from 1.30 to 2 p.m. Trees torn up in great numbers, and many buildings seriously damaged; a newly-built shed, 120 feet long and roofed with slate, was lifted bodily and carried some feet.

Hinckley.—Isolation hospital blown down, patients had to be wrapped in blankets and laid under hedges for protection.

Stoney Stanton.—Several gable ends demolished and some windows blown in, many chimneys broken, and ridge tiles blown away.

Kibworth.—Much damage both to trees and houses.

Wigston.—Terrific storm from 1 to 3 p.m., many brick walls blown over and houses unroofed.

Enderby.—Great damage, rows of chimney pots were swept away like skittles, roofs were broken through, and the roads blocked with fallen trees.

Oadby, Leicester.—Great destruction of trees.

Aylestone, Leicester.—Two men killed by a falling tree, and a girl by a falling wall. Wrecked roofs are too numerous to be counted, and many gable ends have gone.

Old Knighton.—Church so damaged that service could not be held.

Tugby.—Great damage to roofs, chimneys, and sheds.

Skeffington.—Much damage, several roofs lifted off bodily.

Billesdon.—Many trees uprooted, but not so much damage to houses as in adjoining parishes.

Braunstone.—Many trees down, but not much injury to houses.

Leicester.—Chimney stack fell through roof of workhouse, gable end of Clipstone Street Chapel blown in, two factory chimneys fell, and dozens of chimneys and walls damaged and blown down.

Tilton.—The church damaged, and the vicarage lost all its chimneys.

Bagworth.—Several stacks and trees blown over, and much damage done to houses in *Ellistown.*

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LEICESTERSHIRE—(*continued*).

Birstall, Leicester.—Many trees and walls down and the roads blocked, house windows blown in, and roofs damaged.

Somerby.—Many trees down, and extensive damage to roofs and chimneys; the roofs of some outbuildings lifted off.

Syston.—Factory chimney, 75 feet high, fell through roof of engine house.

Sileby, Syston.—Many walls and chimney stacks overthrown.

(*To be continued.*)

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, April 15th, at the Institution of Civil Engineers, Westminster, Mr. E. Mawley, President, in the chair.

Mr. W. Ellis, F.R.S., read a paper on the "Mean amount of cloud on each day of the year at the Royal Observatory, Greenwich, on the average of the fifty years, 1841–90," in which he showed that a principal maximum occurs in winter and a principal minimum in autumn, with a secondary, much less pronounced, maximum in summer and a secondary minimum in spring. There is, however, considerable irregularity in the succession of daily values, the differences between which on consecutive days are in numerous cases relatively large. The means for the different months are:—

January	7·41	July	6·68
February	7·41	August	6·49
March	6·95	September	6·25
April	6·57	October	6·83
May	6·50	November	7·05
June	6·59	December	7·43

Mean of the twelve monthly values ..... 6·85

Grouping the observations into five-day means, the principal maximum occurs January 16th–20th = 7·88: the principal minimum is double, August 29th–September 2nd, and September 18th–22nd, both = 6·06: the secondary maximum occurs June 5th–9th = 7·06, and the secondary minimum May 1st–5th = 6·14.

An examination was made into the distribution of days in different months as regards degrees of amount of cloud. Thus days having an amount of cloud between 0·1 and 3·0 were considered as days of little cloud, days with between 3·1 and 8·9 as days of medium cloud, and days with between 9·0 and 9·9 as days of much cloud.

The cloudless days are most numerous in spring and autumn, and least so in winter and summer, though the variation in this respect through the year seems scarcely so great as might have been expected. The days of little cloud are somewhat less numerous in winter as compared with other parts of the year, in which there is little variation, whilst the days of medium cloud are much more numerous in summer than in winter. The days of much cloud are

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nearly equal in amount in all parts of the year. The overcast days are much more numerous and nearly equal in amount in the first and fourth quarters of the year, much less numerous in the second quarter, and again less numerous in the third quarter. The distribution of days of different degrees of cloud is altogether very similar in the months of December, January, and February, but in March and October differs very little from the distribution for the year as a whole. Decrease in the number of overcast days as summer is approached is accompanied by a nearly equal increase in the number of days of medium cloud, and by scarcely any change in the number of days of much cloud. That is to say the lesser number of overcast days of summer is supplemented, not by an increase in the number of days of much cloud (rather indeed by a slight decrease), but by increase in the number of days of medium cloud, and some increase in those of little cloud.

The paper concluded with a discussion of the relation between the mean amount of cloud and the duration of bright sunshine.

Mr. E. D. Fridlander, B.Sc., gave an account of observations of the amount of dust in the atmosphere at various places during a voyage round the world in 1894–5. The experiments, which were made with a form of Aitken's pocket Dust Counter, showed that there are often considerable variations in the number of dust particles in a very short space of time. Not only did dust occur in the air of inhabited countries, over the water surfaces immediately adjoining them, and up to an altitude of 6,000 or 7,000 feet amongst the Alps, but it was also found in the open ocean, and that so far away from any land as to preclude the possibility of artificial pollution, and its existence has been directly demonstrated at a height of more than 13,000 feet.

Major H. E. Rawson, F.R.Met.Soc., gave an analysis of the Greenwich rainfall records from 1879 to 1890, with special reference to the declination of the sun and moon.

FOG, MIST, HAZE.

To the Editor of the Meteorological Magazine.

SIR,—At meetings of the Royal Meteorological Society, when reference has been made to fog, &c., there has appeared to be an absence of unanimity as to the meaning attaching to the different words in general use, and it occurs to me that discussion of the subject in the *Met. Mag.* might be useful, even if it led to no final result.

In the hope of starting such a discussion, I have set down my ideas as clearly and simply as I am able, and offer suggested definitions.

———

When, by fall of temperature or other change, a mass of air becomes incapable of holding in invisible suspension the aqueous

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vapour which it contains, a portion condenses into visible particles of water, and forms, in the higher regions of the atmosphere, clouds, and at or near the earth's surface fog or mist.

If the fall of temperature be gradual, the individual particles of water will at first be extremely minute, but by further condensation upon them, or by coalescence, they will increase in size till they become visible individually, and may be seen to fall by gravitation.

In the lower atmosphere the particles fall to the ground before they have time to attain such a size as would justify the name of rain-drops, but in the upper air they fall much greater distances, and have time to grow into rain-drops of all sizes.

This condensation from the air is, I take it, the only fog or mist provided by nature. Man at times adds to it the smoke of large towns, which may modify its effect on instruments and prevent its ready return to the invisible form.

The phenomena so far referred to are all the result of a humid, but perhaps not always a supersaturated, atmosphere.

Over and around towns, during anti-cyclonic conditions, with calm air, the smoke accumulates and causes obscuration; to this condition also the name of fog is popularly applied, though the phenomenon is a purely artificial one, and the water particles of Nature's fog are absent.

FOR DEFINITIONS I would suggest:—

Fog.—An obscuration due to the condensation of aqueous vapour in the atmosphere when the individual particles are too small to be seen with the naked eye.

Mist.—An obscuration due to the condensation of aqueous vapour in the atmosphere when the individual particles are large enough to be seen with the naked eye.

Note.—The addition of town smoke (including smoke from forest or prairie fires, &c.) to either of the above to be ignored.

Smoke-fog.—Town smoke without water particles, either *in situ* or drifting over the country.

Haze.—An obscuration of distant objects, so slight that the cause is not visible to the Observer in the air immediately surrounding him.

These definitions would, I think, interfere as little as possible with ordinary nomenclature, and are in fair agreement with recent dictionaries. They would leave the word fog for the majority of country town and sea fogs, mist for what is now frequently called Scotch-mist, and haze as I believe it is usually understood.

The work of Aitken does not, I think, enter into the question, as it is exceptional for the air near the earth's surface to be so free of dust, or other suitable particles, that aqueous vapour has any difficulty in finding nuclei upon which to condense.

Yours obediently,

F.R.MET.SOC.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 18

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	46·1	16	32·0	18	52·4	41·5	43·5	88	87·4	25·1	3·17	19	7·2
Malta	78·1	11	55·5	21	73·3	61·4	58·7	82	130·1	51·1	1·79	11	6·6
Mauritius	84·6	28	64·4	5	81·2	69·9	66·1	75	134·7	57·5	2·58	15	5·3
Calcutta	86·6	11*a*	58·4	23	83·5	66·0	64·4	70	147·2	50·0	·00	0	2·0
Bombay	91·2	19	72·3	29	88·3	75·2	70·4	70	142·5	61·6	0·6	2	1·3
Ceylon, Colombo	90·7	27	72·8	30	87·8	74·3	71·3	77	152·0	64·0	5·83	15	4·9
Melbourne	98 7	25	39·0	12	71·6	50·4	47·8	61	147·2	27·8	·25	5	4·8
Adelaide	103·7	24	43·8	8	79·2	54·6	46·4	48	157·0	34·8	·95	3	3·2
Sydney	89·7	7	53·8	5	73·0	60·0	55·0	70	151·6	44·6	2·62	12	5·8
Wellington	73·8	1	42·2	7	62·2	50·0	47·0	71	136·0	32·0	6·00	16	4·9
Auckland	68·0	21	46·0	27	63·7	51·5	48·8	72	134·0	42·0	5·54	22	5·4
Jamaica, Kingston	89·4	2	68·7	25	87·3	70·9	68·8	80	...	...	1·17	11	4·7
Trinidad	...	...	...	...	...	...	...	...	...	...	..	...	...
Grenada	85·8	2	70·2	29	82·6	74·0	70·7	79	156·6	...	14·61	20	6·4
Toronto	59·2	7	13·3	21	43·2	30·6	32·6	83	76·5	8·0	4·27	12	7·4
New Brunswick, Fredericton	63·7	7	6·6	30	46·1	25·5	31·1	76	...	...	9·96	10	6·3
Manitoba, Winnipeg	42·9	17	−21·7	26	26·3	9·4	...	...	...	...	·95	11	6·8
British Columbia, Esquimalt	58·1	15	20·1	5	48·3	38·7	41·8	94	...	...	3·44	19	7·4

a—and 14.

Remarks.

Malta.—Adopted mean temp. 65°·8, 4°·0 above the average. Mean hourly velocity of wind 7·8 miles. Average temp. of sea 70°·4. Thunderstorms on 12th 14th and 19th, and Lightning on 8 other days. The mean temp. of the month is the highest on record in 12 years. Rainfall remarkably below the average.

J. F. Dobson.

Mauritius.—Mean temp. of air 0°·5 above, of dew point 1°·9 above, and rainfall ·64 in. above, their respective averages. Mean hourly velocity of wind 10·1 miles, or 0·8 mile below the average; extremes, 28·1 on 17th, and 0·0 on 11th and 14th; prevailing direction, E.S.E. to E.N.E. T and L on 16th. C. Meldrum, F.R.S.

Ceylon, Colombo.—Thunderstorms occurred on 10 days. D. G. Mantell.

Adelaide.—Mean temperature same as average of 38 years, rainfall ·05 in. below the average. C. Todd, F.R.S.

Sydney.—Mean temperature 0°·1 below, humidity 0·7 above, and rainfall ·56 in. below, their respective averages. H. C. Russell, F.R.S.

Wellington.—On the whole showery during the month, but a few fine days in the middle and at the end. Prevailing wind N.W.; strong on 9th, 10th and 11th, otherwise moderate. Snow on hills on 28th, and sleet on 26th. Mean temp. 0°·4 below, and rainfall 1·83 in. above, the average. R. B. Gore.

Auckland.—An unusually cold and wet November; the mean temp. being 3° below, and the rainfall more than 2·00 in. above, the average. T. F. Cheeseman.

Jamaica, Kingston.—Mean hourly velocity of wind 2·9 miles. Kingston rainfall one-half the average only; but the Island rainfall was one-third above the average, this result being about the same in each division. R. Johnstone.

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SUPPLEMENTARY TABLE OF RAINFALL, APRIL, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall .	·75	XI.	Lake Vyrnwy	2·03
,,	Birchington, Thor	·75	,,	Corwen, Rhug	1·46
,,	Hailsham	·77	,,	Carnarvon, Cocksidia ...	...
,,	Ryde, Thornbrough	..	,,	I. of Man, Douglas	1·45
,,	Emsworth, Redlands ...	·49	XII.	Stoneykirk, Ardwell Ho.	1·41
,,	Alton, Ashdell	·38	,,	New Galloway, Glenlee	2·48
III.	Oxford, Magdalen Col..	·56	,,	Lilliesleaf, Riddell	·82
,,	Banbury, Bloxham	·66	XIII.	N. Esk Res. [Penicuick]	1·85
,,	Northampton, Sedgebrook	1·06	,,	Edinburgh, Blacket Pl..	·96
,,	Alconbury	·51	XIV.	Glasgow, Queen's Park..	1·83
,,	Wisbech, Bank House...	·68	XV.	Inverary, Newtown	4·57
IV.	Southend	·61	,,	Oban, The Corran	3·02
,,	Harlow, Sheering..... ...	·80	,,	Islay, Gruinart Schools..	2·66
,,	Colchester, Lexden	1·02	XVI.	Dollar.....	2·35
,,	Rendlesham Hall	1·08	,,	Balquhidder, Stronvar...	3·59
,,	Diss	...	,,	Ballinluig	1·15
,,	Swaffham	·76	,,	Dalnaspidal H.R.S.....	3·56
V.	Salisbury, Alderbury ...	·79	XVII.	Keith H.R.S.....	2·05
,,	Bishop's Cannings	1·17	,,	Forres H.R.S.	...
,,	Blandford, Whatcombe .	·54	XVIII.	Fearn, Lower Pitkerrie..	1·54
,,	Ashburton, Holne Vic...	·51	,,	N. Uist, Loch Maddy ...	3·71
,,	Okehampton, Oaklands.	·82	,,	Invergarry.....	4·13
,,	Hartland Abbey	1·06	,,	Aviemore H.R.S.	1·96
,,	Lynmouth, Glenthorne.	1·04	,,	Loch Ness, Drumnadrochit	2·27
,,	Probus, Lamellyn	·97	XIX.	Invershin	2·71
,,	Wellington, The Avenue	·49	,,	Scourie	3·68
,,	Wincanton, Stowell Rec.	·79	,,	Watten H.R.S.....	1·42
VI.	Clifton, Pembroke Road	·78	XX.	Dunmanway, Coolkelure	·88
,,	Ross, The Graig	·81	,,	Cork, Wellesley Terrace	·47
,,	Wem, Clive Vicarage ...	1·41	,,	Killarney, Woodlawn ...	1·59
,,	Cheadle, The Heath Ho.	1·35	,,	Caher, Duneske	·41
,,	Worcester, Diglis Lock	·74	,,	Ballingarry, Hazelfort...	1·05
,,	Coventry, Coundon	1·03	,,	Limerick, Kilcornan ...	1·06
VII.	Ketton Hall [Stamford]	·67	,,	Ennis	...
,,	Grantham, Stainby	·85	,,	Miltown Malbay	1·58
,,	Horncastle, Bucknall ...	·72	XXI.	Gorey, Courtown House	·41
,,	Worksop, Hodsck Priory	·94	,,	Athlone, Twyford	·92
VIII.	Neston, Hinderton	1·19	,,	Mullingar, Belvedere ...	1·19
,,	Southport, Hesketh Park	1·07	,,	Longford, Currygrane...	1·41
,,	Broughton-in-Furness ...	2·55	XXII.	Woodlawn	1·40
IX.	Ripon, Mickley.....	·82	,,	Crossmolina, Enniscoe ..	2·08
,,	Melmerby, Baldersby ...	·61	,,	Collooney, Markree Obs.	2·31
,,	Scarborough, Obs.	·68	,,	Ballinamore, Lawderdale	...
,,	Middleton, Mickleton ...	1·65	XXIII.	Lough Sheelin, Arley...	1·58
X.	Haltwhistle, Unthank...	1·93	,,	Warrenpoint.....	1·28
,,	Bamburgh	·57	,,	Seaforde..	1·29
,,	Keswick, The Bank.....	2·97	,,	Belfast, Springfield	1·97
XI.	Llanfrechfa Grange	·89	,,	Bushmills, Dundarave..	2·07
,,	Llandovery	1·15	,,	Stewartstown	1·44
,,	Castle Malgwyn	1·12	,,	Killybegs	4·34
,,	Builth, Abergwesyn Vic.	1·86	,,	Lough Swilly, Carrablagh	2·87
,,	Rhayader, Nantgwillt...	1·28			

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APRIL, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERAT Max. Deg.	Date	Deg.
			inches.	inches.	in.					
I.	ENGLAND.	London (Camden Square) ...	·55	— 1·19	·08	4	11	68·4	26	32·8
II.		Maidstone (Hunton Court)...	...	...	...	...	...	...	...	...
,,		Strathfieldsaye	·87	...	·15	12	14	...	...	...
III.		Hitchin	·75	— 1·04	·14	12	13	65·0	22*g*	30·0
,,		Winslow (Addington)	·83	— 1·09	·17	15	12	66·0	22	29·0
IV.		Bury St. Edmunds (Westley)	·85	— ·81	·20	4	12	65·0	27	32·0
,,		Norwich (Brundall)	1·43	...	·40	12	16	68·4	27	31·0
V.		Weymouth (Langton Herring)	·67	— 1·21	·44	13	9	64·0	26	35·0
,,		Torquay (Cary Green)	·10	...	·03	13*a*	5	61·9	26	37·6
,,		Polapit Tamar [Launceston]..	·83	— 1·39	·21	13	14	62·4	22*a*	30·5
VI.		Stroud (Upfield)	1·11	— 1·04	·28	13	14	65·0	27	34·0
,,		ChurchStretton (Woolstaston)	1·28	— 1·06	·20	14	16	66·0	24	31·5
,,		Tenbury (Orleton)	1·13	— ·95	·14	10*b*	15	68·8	22	30·1
VII.		Leicester (Barkby)	·88	— 1·22	·13	15	15	...	...	23·0
,,		Boston	·75	— ·96	·22	4	11	68·0	20	30·0
,,		Hesley Hall [Tickhill].....	·70	— 1·01	·12	10*c*	12	64·0	22*h*	29·0
VIII.		Manchester (Plymouth Grove)	1·69	— ·02	·32	16	15	65·0	24*i*	33·0
IX.		Wetherby (Ribston Hall) ...	·69	— 1·16	·26	11	7	...	...	...
,,		Skipton (Arncliffe)	3·37	— ·06	·44	10*g*	19	..	...	...
,,		Hull (Pearson Park).	·87	— 1·05	·21	12	12	65·0	8, 25	30·0
X.		Newcastle (Town Moor)	·76	— 1·07	·12	7	14	...	...	...
,,		Borrowdale (Seathwaite).....	5·67	— 1·47	1·03	26	16	...	...	...
XI.	WALES.	Cardiff (Ely).....	1·01	— 1·40	·18	30	14	...	...	...
,,		Haverfordwest	1·16	— 1·47	·49	13	13	64·0	20	33·9
,,		Aberystwith (Gogerddan) ...	1·41	— 1·15	·40	13	13	63·0	21	...
,,		Llandudno.....	1·35	— ·46	·28	16	14	63·5	24	38·5
XII.	SCOTLAND.	Cargen [Dumfries]	1·98	— ·25	·28	10*d*	14	62·0	24	32·4
,,		Jedburgh (Sunnyside).....	·74	— ·96	·20	10	11	65·0	24*i*	27·0
XIV.		Colmonell	2·09	...	·57	10	12	69·0	20*a*	29·0
XV.		Lochgilphead (Kilmory).....	4·31	+ 1·50	·77	10	21	...	...	29·0
,,		Mull (Quinish).....	2·93	— ·05	·65	15	22	...	...	...
XVI.		Loch Leven Sluices	1·30	— ·92	·40	11*e*	6	...	...	...
,,		Dundee (Eastern Necropolis)	·85	— 1·20	·25	16	14	65·9	21	33·0
XVII.		Braemar	1·05	— 1·37	·23	29	15	63·0	24	26·8
,,		Aberdeen (Cranford)	1·48	...	·25	28	16	65·0	8	...
XVIII		Strathconan [Beauly]	5·33	+ 2·52	1·16	28	13	...	...	...
,,		Glencarron Lodge.....	8·84	...	1·25	7	25	59·7	25	27·8
,,		Cawdor	1·57	+ ·05	·41	10	16	...	...	...
XIX.		Dunrobin	2·00	+ ·27	·65	11	15	58·5	9, 21	31·5
,,		S. Ronaldsay (Roeberry).....	1·68	+ ·07	·31	29	22	58·0	9	33·0
XX.	IRELAND.	Darrynane Abbey.....	1·41	...	·27	11	18	...	...	...
,,		Waterford (Brook Lodge) ...	·46	— 2·01	·12	13	9	66·0	23	33·0
,,		O'Briensbridge (Ross)	1·41	...	·32	10	15	...	...	...
XXI.		Carlow (Browne's Hill)	·58	— 1·70	·11	13	11	...	..	...
,,		Dublin (Fitz William Square)	·88	— 1·24	·33	13	16	64·5	24	36·1
XXII.		Ballinasloe	1·02	— 1·32	·23	26	13	65·0	23	32·0
,,		Clifden (Kylemore)	2·76	...	·46	11	20	...	...	...
XXIII		Waringstown	1·28	— 1·14	·21	15	14	70·0	19*j*	29·0
,,		Londonderry (Creggan Res.).	3·03	+ ·79	·43	28	20	...	...	...
,,		Omagh (Edenfel)	2·52	+ ·29	·30	10*f*	18	64·0	21	33·0

+Shows that the fall was above the average ; —that it was below it.

a—and 24. *b*—and 28. *c*—and 14. *d*—and 16, 28. *e*—and 17. *f*—and 13, 15, 28. *g*—and
h—and 24, 25. *i*—and 25. *j*—and 20. *k*—4, 23.

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METEOROLOGICAL NOTES ON APRIL, 1896.

Abbreviations.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder: L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

Addington.—A rather cold month, with a small rainfall. At no time was the frost severe enough to harm any vegetables. Stormy on the morning of the 11th. Sleet and S on the 12th. Foggy mornings on 21st and 23rd.

Bury St. Edmunds, Westley.—A dry month; R in small quantities on 12 days. Migratory birds several days later than usual; first swallow on 17th, cuckoo on 19th, nightingale on 22nd, sand marten on 27th, and turtle dove on 29th. H on 10th, distant T on 11th, and T on 12th.

Norwich, Brundall.—R ·24 in. deficient, and for the first four months of the year 1·14 in. deficient. Mean temp. 47°·3. Vegetation rather early; earlier than in 1895, but later than in 1893 and 1894. H on 1st, 2nd, 29th, and 30th; T on 17th, at 4 p.m.; T and L on 29th; Solar halo on 21st, at 5 p.m.

Weymouth, Langton Herring.—With the exception of April, 1893, the driest April since 1875. The average 9 a.m. temp., 51°·1, is 3°·7 above the average of 24 years, and with the exception of 1893 and 1894, the highest in that period. Distant T and L on the 23rd. Fog on 27th. Hawthorn in blossom on the 27th. The rainfall of the first four months of the year (4·85 in.) is the smallest for 22 years, and only 56 per cent. of the average.

Torquay, Cary Green.—Rainfall 2·36 in. below the average; mean temp. 50°·5, or 2°·4 above average. Duration of sunshine 136 hours 40 minutes, being 53 hours 50 minutes below average; one sunless day.

Polapit Tamar [Launceston].—Very dry, the rainfall being only two-fifths of the average; unusually free from storms or strong winds. Bar. throughout very high. Fog early on the 8th.

Woolstaston.—A beautiful spring month; all vegetation in a very forward state. Mean temp. 48°·6. Gale, with S and H on the 12th, and a meteor of remarkable brilliance passed from N.W. to S.E. about 8.5 p.m. on the same day; the light was most intense and of a pale blue colour.

Tenbury, Orleton.—A warm, dry month, the mean temp. being nearly 3°·5 above the average. No extremes of heat or cold. Cherries, damsons, and plums in full blossom at the beginning of the month; pears about the 16th, and apples at the end of the month. Cuckoo heard on 14th.

Leicester, Barkby.—A fine but chilly month. Scarcity of water already felt. Abundant bush and tree bloom. First swallow seen on 2nd; first cuckoo on 21st. Mean temp. 48°·0. Only 4·52 in. of R in the first four months of the year!

Manchester, Plymouth Grove.—Thick fog on 14th and 20th; dense fog in early morning of 22nd. T and L on 28th. Mean temp. 48°.

WALES.

Haverfordwest.—The month was fine, bright, and sunny; although R fell on 14 days, the quantities were small, and the general character of the weather was mild and dry. Vegetation very forward, and fruit trees in full blossom. The oak in sheltered places was in leaf on the 22nd; lilacs, chestnuts, laburnums, and rhododendrons in full bloom. High bar. pressure characterised the whole month. R anxiously looked for at the close.

Aberystwith, Gogerddan.—The weather was very good throughout the month; winds N. and N.W.

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SCOTLAND.

CARGEN [DUMFRIES].—The meteorological conditions of the month were very favourable. Barometric pressure was higher and temp. considerably warmer than the average of 37 years; there was also less R and more sunshine; while easterly winds, usually prevalent during April, were practically absent. The min. temp. did not fall to freezing point, an experience only once previously (in 1867) recorded. Rains were always light, but 1·30 in. fell in the seven days 10th to 16th, immediately followed by a marked rise of temp., the effect on vegetation of all kinds being very beneficial. Many trees were in full leaf at the close, and lilac, laburnum, and horse chestnut just bursting into flower. Farm work very forward. Sleet on 10th; H on 28th.

JEDBURGH, SUNNYSIDE.—The weather was cold and ungenial, with much E. and N.E. wind and a low night temp., but a good deal of sunshine. The land being dry, seed sowing is far advanced. Swallows seen on 22nd.

COLMONELL.—Rainfall ·24 in. below the average of 19 years. Mean temp. 48°·4, or 3°·7 above the average. H on 10th and 11th.

MULL, QUINISH.—Vegetation quite two weeks earlier than usual. Horse chestnuts and planes in full leaf by 15th. Cuckoo seen on 26th.

BRAEMAR.—A most favourable month for seed sowing. Duration of sunshine, 152 hours 10 minutes.

ABERDEEN, CRANFORD.—The month was very dull and cloudy.

S. RONALDSAY, ROEBERRY.—A cold month. Mean temp. 45°·2.

IRELAND.

DARRYNANE ABBEY.—A dry, fine month.

WATERFORD, BROOK LODGE.—Thick fog on mornings of 20th, 21st, and 22nd. H showers on 28th and 30th. Heavy T on 29th.

O'BRIENSBRIDGE, ROSS.—The best month of April for many years; cloudless sunshine for many days, and scarcely a touch of frost. Vegetation good and very forward.

DUBLIN.—A very favourable fine and spring-like month. The steadiness of the bar. was a feature of the first ten days of the month. A relapse into winter took place on the 27th, from which day the weather remained cold to the end. Very little easterly wind. Mean temp. 50°·9, or 3°·2 above the average. Slight fogs on the 20th and 21st. High winds on 8 days, reaching the force of a gale on the 10th and 12th. H fell on the 10th, 11th, 12th, 28th, 29th, and 30th. T was heard on the afternoon of the 29th.

EDENFEL, OMAGH.—On the whole a seasonable April, with occasional raw cold spells, but nothing to check vegetation, which is full and forward for the season.

THUNDERSTORM OF MARCH 24TH, 1896.

TEAN VIC., STAFFORD.—A grand TS here on 24th, between 7.50 and 9.20 p.m. Storm came up—as usual with storms here—from S., hovered for some time between S. and S.E. at a distance of from 4 to 5 miles, then advanced to a point nearly overhead—time interval for some minutes = 3 to 4 seconds. Then it moved slowly to E. L very vivid, and T almost continuous till 9 p.m. T last heard at 9.15 p.m., L last seen at 9.30 p.m. G. T. RYVES.

SALT VIC., STAFFORD.—A severe TS occurred here on March 24th. It commenced at 6.15 p.m. in S.W., and worked away towards N.W. It then backed to S.W., and worked through S. to S.E., and then another storm approached nearer from S.W. and worked through S. to E., accompanied by vivid forked lightning and heavy rain; ·25 in. fell in ten minutes. Lightning was seen in E. and N.E. until 10.30 p.m., and thunder was heard twice on the following day.

24th.....	Max. 60°	.....	Min. 28°	.....	Rain ·27 in.
25th.....	,, 58	.....	,, 39	.....	,, ·10 ,,

S. W. JONES.

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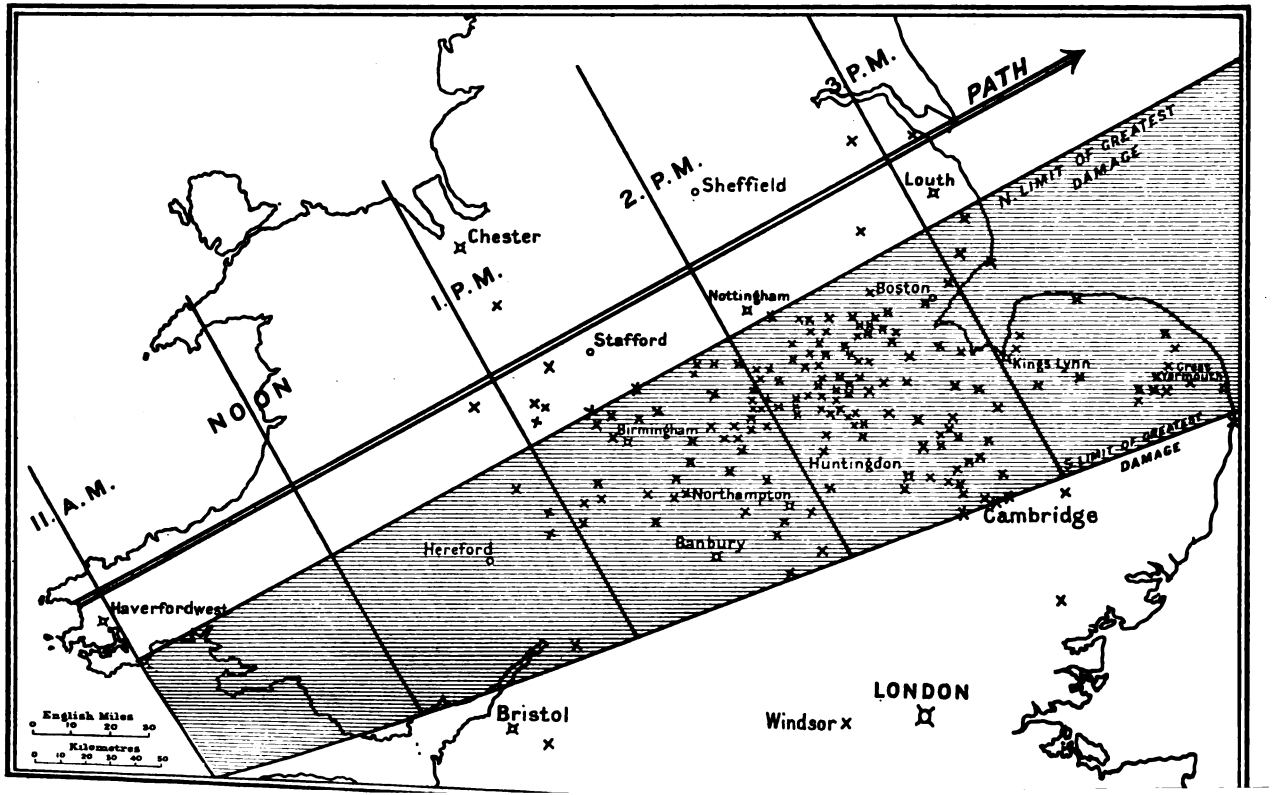
SITES OF STRUCTURAL DAMAGE BY THE GALE OF MARCH 24TH 1895.



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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXV.] JUNE, 1896. [PRICE FOURPENCE, or 5s. per ann. post free.

THE WORST GALE OF THE 19TH CENTURY IN THE ENGLISH MIDLANDS.

(*Continued from p.* 57.)

LEICESTERSHIRE—(*continued*).

Great Dalby.—The school, chapel, and many private houses damaged.

Rotherby.—On the main road hence to Leicester there are, within one half-mile, 14 trees blown across the road, 12 so large as not merely to cross the road but to reach into the fields beyond.

Ashby-de-la-Zouch.—Pinnacle blown off the parish church, and hundreds of trees uprooted.

Frisby-on-the-Wreak.—Tremendous storm between 2 and 3 p.m. A strong wall blown down, and also so many trees that the roads were blocked.

Asfordby, Melton Mowbray.—Few houses escaped entirely, and many ricks were blown over.

Melton Mowbray.—Much damage to property, the brewery chimney blown down, and trees of all descriptions broken or uprooted. The streets strewn with tiles, skylights, &c.

Wymondham.—Terrific gale, 1 to 3 p.m.; one lofty and many private chimneys blown over, in fact few buildings escaped entirely.

Sheepshed.—Terrific storm from 1.50 to 2.20 p.m., about 15 yards of the wall of the cemetery was blown down, and the streets were littered with tiles, slates, and spouts.

Loughborough.—Besides small injuries, three factory chimneys fell about 2.30 p.m., one being 114 feet high. A wooden theatre was wrecked, and two gable ends were blown out.

Belton.—Roof of parish church and of many private houses damaged, air full of thatch.

Garthorpe.—A pinnacle blown off the church roof.

Ab-kettleby.—Damage general, but not very serious.

Buckminster.—The conservatory at Lord Dysart's house was completely lifted from its foundations and fell a perfect wreck. Much other damage was done.

Sproxton.—Two heavy double chimney stacks on Sproxton Lodge overturned and broke through the roof.

Waltham.—Gale worst, 2 to 3 p.m.; two houses stripped of every tile and one of all its thatch, the gable end of one house was blown in, several chimneys overthrown.

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LEICESTERSHIRE—(*continued*).

Stathern.—Much damage; two cottages had part of their gables displaced and became uninhabitable.

Harby, Melton Mowbray.—Many stacks overturned, and many houses lost tiles, slates or thatch.

RUTLANDSHIRE.

Seaton.—Church spire damaged, and a cross at the end of the nave overthrown.

Barrowden.—Chimneys, roofs and stacks damaged, and the spray from the river carried into the village.

Uppingham.—Much damage from 2 to 2.30 p.m.; the town strewn with slates, chimney pots, &c. So many trees across the main road that the mail cart had to be sent another way.

S. Luffenham.—Windmill wrecked.

N. Luffenham.—A chimney stack overturned at the inn, and slates or thatch torn off nearly every house.

Preston.—There is scarcely a building undamaged, the top of the church spire loosened.

Ridlington.—Terrible gale, many stacks blown away.

Ketton.—Many chimneys blown over, and the roads blocked with fallen trees. Gale worst, 2 to 3 p.m.

Hambleton.—Two large trees overturned about 2 p.m., one of them broke through the roof of a house, and also knocked down the chimneys.

Great Casterton.—Churchyard wall blown down, also chimney at Wesleyan school.

Empingham.—The worst storm remembered. Thatch, tiles and slates were hurled in all directions, and many trees overturned.

Oakham.—Considerable damage, houses unroofed and chimney stacks blown down. Two pinnacles blown off the parish church.

Ryhall.—Violent gale between 1 and 3.30 p.m., carrying away not only stacks and trees but even wooden buildings.

Burley-on-the-Hill.—Great damage to the trees; out of the elm avenue, 60 were torn up.

Teigh.—Several houses stripped and stacks blown away. A pinnacle blown off the church, but it did not break through the roof.

LINCOLNSHIRE.

Stamford.—The majority of the churches and houses were damaged. The gale was so heavy that the water of the Welland was blown into waves, and the spray carried over the bridge. A chimney, 65 feet high, was seen to oscillate, and a gust at 2.15 p.m. brought it down.

Market Deeping.—Houses unroofed and chimneys blown down in great numbers. On the Lolham Road, 27 large trees uprooted.

Crowland.—The storm lasted from 1 to 4 p.m., and did more damage than any storm remembered. The windmills lost their sails, nearly every large chimney is gone, many houses are unroofed, and 17 fine elms were blown down in one row. The streets presented a lamentable appearance, just as if there had been a bombardment.

Castle Bytham.—Windmill damaged, and many roofs stripped.

Bourne.—Great havoc among the trees, and between 2.30 and 4 p.m. the streets strewn with wreckage from the roofs.

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LINCOLNSHIRE—(*continued*).

Long Sutton.—Enormous damage; houses unroofed, chimneys blown down, trees uprooted, stacks overturned, and skylights removed. Very few houses escaped.

Holbeach.—A Maltese cross blown off the cemetery chapel, a chimney stack fell through a roof, a long wall was blown down, and several windmills were damaged.

Spalding.—The damage has not been equalled for many years. At the Johnson Hospital, a chimney stack fell through the roof into one of the wards. In several parts of the town, house ends were blown in and roofs removed in whole or in part. At St. John's Church, during afternoon service, part of one end was blown in, and part of the roof removed. The end of *Whaplode* cemetery chapel was also blown in.

Colsterworth.—The gale between 2 and 3 p.m. stripped slates, tiles, or thatch from nearly every roof.

Corby.—Church so damaged that evening service was not held.

Surfleet.—Scarcely a building escaped without loss of tiles or slates, and many chimney stacks were overturned.

Aslackby.—Several trees down and roofs damaged.

Pointon.—The bell turret and bell at the schools blown down, and the north side of the roof of the church so damaged that service could not be held.

Gosberton.—Church and chapel both damaged.

Billingborough.—Terrible havoc for about half-an-hour, about 3 p m.; both public and private buildings have suffered severely. The public hall and the board schools are badly damaged.

Ropsley.—A pinnacle of the church blown down, and in falling it carried away part of the old church, dating back to 1486; private houses merely lost tiles or slates.

Horbling.—Two of the pinnacles of the church, each surmounted by a vane, were carried away.

Donington.—House property suffered severely, and many trees were blown down.

Grantham.—Chimney stack overturned about 3 p.m., and fire escape blown on to roof of engine house; street lamps blown down, and many roofs stripped.

Swaton.—One of the pinnacles was blown off the church, fell on to the chancel roof, and broke through and smashed one of the choir stalls.

Great Hale.—The church was so weakened by the gale that extensive repairs will be necessary.

Boston.—Several warehouses partly unroofed, a corrugated iron building overturned, also a new wall, 60 feet long, and many chimney stacks. Most of the churches and schools were damaged.

Honington.—Streets and roads blocked by broken trees and portions of roofs.

Long Bennington.—Considerable damage to chimneys, and many trees down.

Sleaford.—About 6 feet blown off the top of the Handley Monument, several houses damaged by chimney stacks falling through the roofs, and a pinnacle blown off the west front of the church.

Skegness.—Considerable damage to chimneys and roofs.

Spilsby.—Trees and chimneys have been blown down and stacks scattered, but the damage was less severe than at some other places.

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LINCOLNSHIRE—(*continued*).

Horncastle.—The damage was not very serious, but roofs, chimneys, &c., suffered.

Fiskerton.—A gale of unexampled fury, the river Witham was as rough as the sea, and washed over the ferry boats and filled and swamped an open one. Much damage to farm buildings, and many stacks scattered.

Lincoln.—No serious damage.

Alford.—Three of the crocketted pinnacles of the church tower were blown down, two of them cut large holes in the roof of the nave. Many trees and chimneys blown down, and part of the roof taken off the goods station of the G. N. R.

Louth.—Between 3 and 3.30 p.m. it was not safe to be in the streets, not merely owing to falling tiles and masonry, but because it was hardly possible to stand.

Brigg.—In the afternoon, children were lifted off their feet and blown down. Many stacks of chimneys fell, and tiles and chimney pots went away by dozens.

Grimsby.—Considerable damage, several chimney stacks overturned, one fell through the roof of the hospital and killed a patient. The roof of a house at *Scartho* was lifted bodily and carried some distance.

NOTTINGHAMSHIRE.

Cropwell Bishop.—Several buildings damaged, trees and stacks blown over.

Nottingham.—Roof of goods shed at Midland Railway destroyed, and two plate glass shop windows blown in. Many trees down in the suburbs.

CHESHIRE.

Dodcott.—An extensive run of farm buildings wrecked, and cattle buried under them.

Chester.—Windows blown in, chimney pots, chimneys, and tiles blown away.

The following note, which has been received since the issue of our last number, is a valuable addition to the Worcestershire details.

SIR,—In the catalogue of disasters caused by the great storm on March 24th, 1895 in Worcestershire, the damage to the beautiful Priory Church at Malvern might be included. Two pinnacles were blown down and fell through the roof, the cross at the E. end was taken off, and a window was blown in. Many houses were damaged, and on this one, every chimney pot but one was dislodged. The gust which did the mischief occurred about 1 p.m.—Yours faithfully,

C. S. PRINGLE.

Knotsford Lodge, Malvern.

SUMMARY.

From the evidence in the previous 11 pages of this article it will be seen that the storm crossed from S. Wales to Lincolnshire between 11 a.m. and 4 p.m. on Sunday, March 24th, 1895. There is no day or time at which so few regular meteorological observations are made as during these five hours on a Sunday. Consequently in studying the storm path we have to rely upon (1) the reports of skilled observers such as those in the *Met. Mag.* 1895 pp. 41-43 and 51-52, (2) the records of self-recording instruments, and (3) the

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numerous statements made by our correspondents and in the local newspapers.

The Meteorological Office had ordered storm signals to be hoisted, and at 8 a.m. on the 24th, the centre (28·50 in.) of a well-marked cyclone was over the Shetland Isles, but it was not that cyclone which caused the mischief, but a "secondary" at the South of Ireland where (but for its existence) the pressure would have been about 29·2 in. Instead of 29·2 in., however, it was under 29 inches, and it was this small disturbance which rushed across Wales and England, leaving death and disaster along its track, and which at 6 p.m. had (according to the *Weekly Weather Report*) nearly reached Denmark. This would imply an average velocity of translation of about sixty miles an hour.

Next we turn to the times recorded by our own correspondents, and in the notes which we have already given—some, it is true, are vague—a very few (*e.g.*, Peterborough, 1.50 p.m.) are obviously wrong, but we tabulated them all before putting any of them on a map, and therefore without adapting them to fit any theory. Having plotted them all (about 70 places) on a map we find that they agree very well with a path going E. 30° N. from St. Bride's Bay in South Wales to Spurn Head, being over Haverfordwest at 11 a.m. and going at the rate of *58 miles an hour*—thus agreeing very closely with the direction and velocity obtained from the publications of the Meteorological Office.

Very little damage was done north of the path which we have mentioned, nor was the mischief serious on or near to the path on its south side—but it seems that the greatest havoc was wrought in a zone whose northern limit was about 30 miles south of the line, and which increased in breadth (going eastwards) from 50 to about 70 miles.

These features we have represented on the accompanying map, which we are quite aware is much more rectilinear than is usual. The path might have been drawn as a curve from a centre 500 miles to N.N.W., and the hour lines might have been curves drawn with radii of 100 miles, but straight lines fitted the facts better than curves; and, after all, the position of the × (sites of damage) and the times recorded in our account are the essential features, and having put the facts on record, we do not at all mind how severely our diagram is attacked.

Since drawing the map, we have come upon two observatory reports giving time, and it is satisfactory to find that they fit almost precisely the lines laid down. The statements are:

Birmingham.—The greatest pressure of the wind was 37lbs., but the time is not known, as *the oscillation of the building stopped the clock at* 1.30 *p.m.* (According to our map, the centre passed Birmingham at 1.25 p.m.).

Greenwich.—Max pressure 36lbs. at about 2.10 p.m. (Precisely the time shown by our map).

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As to the damage, we are aware that our list is far from complete, and it would be absurd to attempt to put any specific sum as covering the disasters. The loss of life was wonderfully small, only 14 deaths are reported, but the cases of injury were far more numerous.

The foregoing reports from more than 200 localities naturally afford material for consideration. We are, of course, aware that an open door or window facing a very strong wind may cause one on the opposite side of the house to be blown out, and there are several instances in the preceding list of windows and of gables being blown *in*, but on the other hand we find more than a dozen cases, many of which could be very well explained by the expansion of the air inside the building, owing to the passage of a diminished atmospheric pressure. The following are the cases to which we refer.

Place.	Event.	Page on which reported.
Tottenham Court Road ...	Window blown out	50
Peterborough	Gable ends forced out. Wood and iron stable lifted bodily.....	51
Godmanchester.....	Gable fell outwards	51
Soham	Several cottages had one end blown out.....	52
Norwich	Workhouse roof lifted. Roofs of two cottages lifted.....	53
North Heigham	The gables of several houses fell out	53
Ironbridge	Two windows blown out.....	54
Worcester..	The roof of a tannery was lifted bodily	55
Stratford on-Avon	Roof of goods shed lifted off	55
Broughton Astley	A newly-built shed, 120 ft. long and roofed with slate, was lifted bodily and carried some feet	56
Loughborough	Two gable ends were blown out	65
Buckminster.....	The conservatory .. ... was completely lifted from its foundations and fell a perfect wreck	65
Grimsby	The roof of a house at Scartho was lifted bodily and carried some distance	68

ROYAL METEOROLOGICAL SOCIETY.

The monthly meeting of this Society was held on Wednesday evening, May 20th, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. E. Mawley, F.R.H.S., President, in the chair.

Mr. R. H. Curtis, F.R.Met.Soc., read a paper on the exposure of anemometers, and showed photographs of the positions of several of the British anemometers, and referred to the deflection of the wind by the various buildings on which they were mounted, and by surrounding objects. The effect of surroundings in both diminishing and increasing the records obtained was clearly exhibited by a critical

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discussion of the results of the Kew pattern Robinson, the Stokes's bridled, and the Dines's pressure tube, anemometers at Holyhead. The position of the instruments was shown in plan, and by near and distant views from various points of the compass. The exposure of the Tube and Bridled instruments is proved to be satisfactory by the accordance of the results, while the Robinson, mounted 5 feet above the apex of the lantern of a disused lighthouse, and 53 feet above the floor of the pier, is variously affected by sheds and erections on the pier, although all of them are about 30 feet below the cups.

The values were arranged according to the direction of the wind under eight points, and afterwards the observations under each direction were grouped according to the velocity, in 10-mile groups; *e.g.*, all the observations of wind from North in which the force ranged from 26 to 35 miles per hour, as shown by the Robinson instrument, were put together, and the mean difference between the records of the two instruments obtained; and similarly for each of the other seven points, and for the other velocities. No observation in which the force was less than 11 miles per hour was used, and the lowest group included all velocities from 11 to 25 miles per hour.

Taking first the means of all the observations under each point, irrespective of velocity, it was found that with wind from N., S.E., and S., the record of the Robinson instrument is *greater* than that of the "Tube" instrument; whilst with winds from E., S.W., W., and N.W., it is *less*; with a N.E. wind, however, the record by both instruments is the same. The greatest excess is 13·2 per cent. with S. winds, and the greatest deficiency 22·8 per cent. with W. winds.

Examining the groupings under velocities, it is found that generally the amount of the difference varies directly with the force of the wind, and therefore the maximum errors are greater. Thus the greatest excess is 18·3 per cent. with S. winds of velocity 36 to 45 miles, and the greatest deficiency 24·1 per cent. with W. winds, velocity 11 to 25 miles.

In grouping all winds under eight points of the compass, the results for any one wind are to a certain extent masked by the inclusion of winds blowing in a slightly different direction (*e.g.*, the observations under E. include all between E.N.E. and E.S.E.). This is clearly shown by the tabulation of about 40 observations of velocity 11 to 25 miles at each of the sixteen points, which gives for S.S.E. an excess of 21·8 per cent., and for W. a deficiency of 25·2 per cent., or a total range of error of 47 per cent.

The conclusion of the whole matter is: that for anemometrical records to be reliable, not only must the instrument be exposed in an open place, free from local obstructions, but the stand which carries it must offer practically no resistance to the wind; that the "stand" should be formed by a house, no matter what its shape or size, unless the cups can be placed farther above the roof than is

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generally possible, is undesirable, not to use a stronger term. A suitable open structure, with a hut for the recording apparatus, could generally be erected wherever a Robinson, or a pressure plate, instrument is required; but one of the great advantages offered by the Dines's "Tube" instrument is the facility with which the vane can be placed in a satisfactory position.

In the discussion which followed, the President spoke of the unsatisfactory condition of Anemometry shown by the paper, and said that he would like to see a comparison of the records of a set of similar instruments well exposed at different heights above ground.

Mr. Gaster said it was evident that the Robinson anemometer at Holyhead was sheltered, and that many others were worse. Comparison of the light vessel and anemometer observations at Yarmouth showed that with a W. wind of 50 miles an hour, the instrument recorded only 25 miles owing to the friction in passing over the houses in the town.

Mr. Symons exhibited a diagram drawn by the Rev. F. W. Stow, illustrating the effect on air currents of objects surrounding a rain gauge, and said that as early as 1862 or 1863, the late Dr. Clouston, of Orkney, had pointed out the bad result of placing an anemometer on the roof of a house.

Mr. Dines considered the bridled anemometer to be the only reliable form of pressure instrument in use. If the exposure be bad for one direction or force it is bad for all. He had three similar instruments, 40 feet, 20 feet, and 10 feet above the roof of his house, and found that from directions in which the exposure was good, taking the 40-feet instrument as true, the 20-feet gave a record of 90 per cent., and the 10-feet of 80 per cent., while from a sheltered direction the 20-feet gave 80 per cent., and the 10-feet 70 per cent., the difference being the same with all velocities.

Mr. C. Harding did not think he was speaking too strongly in describing the whole science of Anemometry as rotten. At Yarmouth the town reduced the velocity of a W. wind by half, while an E. wind was increased by striking the house on which the instrument was fixed, and being deflected upwards. He believed that the enormous difference in the records at Fleetwood and Liverpool was entirely due to exposure, while the paper showed that at Holyhead, which had been looked upon as one of the best stations in the country, there was an error of nearly 50 per cent. between the records of two different winds. He referred to the good work done by Mr. Chatterton for the Wind Force Committee in comparing the records of anemometers with the records of light ships, and thought that the comparison of the Beaufort Scale and Anemometer results should be re-worked.

Mr. Baker hoped that the paper would bear good fruit, as the question of Anemometry was to be discussed at the International Congress at Paris.

Mr. Munro said that the Robinson anemometer was so constructed

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as to be unsuitable for fixing more than about 15 feet above a roof, as the upper works weigh about three cwt.

Mr. Baldwin Latham compared the measurement of wind velocity to the measurement of the current in a river in which, with a rocky bed it is almost impossible to get true results.

Admiral Maclear, Dr. Mill, and Messrs. R. H. Scott, R. Inwards, H. Southall, and C. E. Peek also took part in the discussion.

An interesting collection of photographs of clouds, presented to the Society by Mr. H. C. Russell, F.R.S., of the Sydney Observatory, was also exhibited.

FOG, MIST, HAZE.

To the Editor of the Meteorological Magazine.

SIR,—It appears to me that your correspondent in this month's Magazine has stated very fairly the facts which should form the basis of any discussion as to the use which meteorologists should make of the above terms; and especially do I agree with him in the distinction which he draws between the artificially produced smoke-fogs of large towns, and "nature's fog," which, as he points out, is always composed of water particles alone.

To discriminate between these two phenomena, which resemble each other only in the fact that they both cause obscuration, is, I consider, most important, since the conditions under which they are formed are essentially different in the two cases. To do so, however, in such a city as London, is not always easy; because, although the anti-cyclonic smoke-fogs are generally free from water particles, and are true "dry fogs," the water fogs are always combined with more or less smoke, making it sometimes difficult to say which predominates, and in which category the fog should be placed. If, however, the smoke-fog is to be confined to anti-cyclonic conditions, as I gather is the view of your correspondent, this difficulty would be much reduced.

As regards the suggested definitions, I do not think it wise that the difference between fog and mist should rest upon what can "be seen with the naked eye"—a test in which I fear two persons would be very apt to disagree. If I correctly understand your correspondent, he would describe as "mist" a fog in which the water particles were just merging into tangible rain-drops—a view of the matter which I think will meet with the approval of most meteorologists, although I know that many have hitherto regarded a mist as a slight fog. But, assuming your correspondent's definition to be acceptable, it would surely be possible to define the condition in such terms as would make what is meant perfectly clear, without leaving much to the judgment of observers, and leaving still less to the arbitration of a sense which varies so much with different men as eyesight.

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There is only one other criticism I would offer, which is that town smoke, "*drifting over the country*," would in all probability have become so attenuated, as soon as it had got clear of its place of origin, as to bring it within the definition given for "haze," rather than fog.

But, generally, I agree with the definitions offered; and at all events a practical scheme, based on a correct view of the phenomena, has been put forward, which it should not be difficult to modify in such a way as to make it generally acceptable to meteorologists.

I am, yours obediently,

F.R.MET.SOC.No. 2.

BURST WATER PIPES.

OUR readers may remember the discussion in the *Met. Mag.* in 1895 as to burst water pipes, and that we urged that the water in the mains did not freeze because the ground around the pipes was frozen—*i.e.*, because they were not laid deep enough—but because ice-cold water was poured into them, and because cold was conducted to them by inadequately protected house services and by fire hydrants—in fact, by cold conducted to the mains otherwise than through the earth.

Dr. Jordan's report* confirms this view. He says (p. 15): "The freezing of water pipes caused considerable inconvenience in this district [Lancashire]; the nature of the ground and the amount of shade must have had some influence in this respect, because some pipes, fully 2 feet deep, appear to have frozen. My notes show that at 2 feet deep, in ground fully exposed, the lowest temperature recorded was 32°·8 on February 17th, 18th, and 19th, 1895."

We have, therefore, here one more case of the water pipes being colder than the soil at the depth at which they were sunk.

We hope that it will be many years before such a frost occurs again in this country, but we feel sure that the remedy lies rather in stopping the conduction of cold to the mains, than in the costly method of sinking them to a considerable depth.

LIGHTNING AND TREES.

INVESTIGATIONS made by Dr. Carl Müller, and reported in *Himmel und Erde*, show that lightning prefers to strike certain kinds of trees. Under the direction of the Lippe-Detmold Department of Forestry, statistics were gathered showing that in eleven years lightning struck fifty-six oaks, three or four pines, twenty firs, but not a single beech tree, although seven-tenths of the trees were beech. It would seem, then, that one is safer in a storm under a beech tree than under any other kind.

* Report of F. W. Jordan, M.R.C.S., Dip.San.Sci., &c., Medical Officer of Health to the Heaton Norris District Council for the year 1895. 8vo., Heaton Norris, 20 pages and folding plate.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1895.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	56·4	5	26·1	22	44·9	35·2	36·5	87	62·9	25·9	2·19	16	7·0
Malta	69·9	19	44·2	31	61·2	53·4	48·7	76	115·8	38·0	3·52	15	6·9
Mauritius	83·7	8	67·3	16	81·6	72·2	67·3	75	134·5	57·2	6·55	16	6·5
Calcutta	80·6	2	47·4	25	76·7	54·7	50·9	61	136·6	38·0	·00	0	2·2
Bombay	87·9	30	66·0	15	85·1	70·1	63·3	63	135·5	51·8	·00	0	1·5
Ceylon, Colombo	89·7	16	69·2	12	85·9	73·2	69·2	76	150·0	62·0	9·44	14	5·6
Melbourne	98 9	8	45·3	30	77·7	54·8	51·9	64	155·9	35·1	2·17	15	5·1
Adelaide	99·8	7	50·2	22	82·3	59·2	49·9	48	155·5	39·8	·69	9	3·9
Sydney	96·1	15	58·5	30	80·5	65·3	59·0	64	157·2	49·4	2·90	20	5·8
Wellington	76·0	30	53·0	12	68·9	57·5	55·1	75	145·0	40·0	1·62	12	4·6
Auckland	83·0	31	52·0	1	72·6	58·1	55·2	71	142·0	48·0	·99	5	4·0
Jamaica, Kingston	89·0	8	62·8	21	85·6	68·2	65·5	74	...	...	1·87	3	3·2
Trinidad	90·0	5	67·0	*var.*	86·5	69·4	71·1	81	165·0	64·0	7·32	8	...
Grenada	...	...	...	...	...	...	...	...	...	...	...	...	...
Toronto	53·9	20	1·4	12	36·0	23·2	28·0	84	70·0	—3·0	4·21	15	8·0
New Brunswick, Fredericton	57·7	31	—14·8	13	32·6	14·4	21·4	78	...	...	2·66	8	5·1
Manitoba, Winnipeg	43·9	13	—28·7	26	19·9	—3·9	...	...	...	...	1·75	13	5·6
British Columbia, Esquimalt	55·1	11	24·2	17	44·1	36·1	38·6	92	...	...	11·60	26	8·1

REMARKS.

MALTA.—Adopted mean temp. 56°·9, 0°·7 above the average. Mean hourly velocity of wind 12·2 miles. Average temp. of sea 64°·9. Thunderstorms on 4 days, and lightning on 2 other days. H on 3 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·7 below, of dew point 0°·6 below, and rainfall 1·37 in. above, their respective averages. Mean hourly velocity of wind 11·8 miles, or 0·9 above average; extremes, 27·9 on 26th, and 0·0 on 13th; prevailing direction, E.S.E. to E. by N. Lightning on 18th, 19th, and 20th. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Lightning was seen on the 2nd. Thunderstorms occurred on the 3rd, 4th, 17th, and 18th. D. G. MANTELL.

Adelaide.—Mean temp. 0°·2 below the average of 38 years; rainfall ·16 in. below the average. Total rain for the year 21·28 in., or ·83 in. above the average. C. TODD, F.R.S.

Sydney.—Mean temp. 3°·1 above, humidity 5·3 below, and rainfall ·30 in. above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Fine in the early part of the month; showery from 4th to 11th, and slight rain occasionally from 15th to 23rd, with intervals of fine weather; the latter part fine. Prevailing wind N.W.; strong on nine days. Mean temp. 2°·4 above the average, and rainfall 2·19 in. below, or less than half, the average. R. B. GORE.

Auckland.—An unusually dry month, the rainfall being less than half the average. Mean temp. slightly below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 3·9 miles. "Northers" on 11th, 13th, and 14th. Kingston rainfall about the average; Northern half of Island two-thirds, and Southern half one-fourth, the average fall, giving a mean of half the average for the Island for the month. Kingston rainfall for the year 55 per cent., and Island rainfall 95 per cent., of the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 2·61 in. above the average of 30 years. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, MAY, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall.	·38	XI.	Lake Vyrnwy	...
,,	Birchington, Thor	·31	,,	Corwen, Rhug	·16
,,	Hailsham	·36	,,	Carnarvon, Cocksidia ...	...
,,	Ryde, Thornbrough	·50	,,	I. of Man, Douglas	·27
,,	Emsworth, Redlands ...	..	XII.	Stoneykirk, Ardwell Ho.	·61
,,	Alton, Ashdell	·33	,,	New Galloway, Glenlee	·62
III.	Oxford, Magdalen Col..	·19	,,	Lilliesleaf, Riddell	·78
,,	Banbury, Bloxham	·21	XIII.	N. Esk Res. [Penicuick]	·50
,,	Northampton, Sedgebrook	·27	,,	Edinburgh, Blacket Pl..	·57
,,	Alconbury	·39	XIV.	Glasgow, Queen's Park..	·60
,,	Wisbech, Bank House...	·45	XV.	Inverary, Newtown	·86
IV.	Southend	·19	,,	Oban, The Corran	...
,,	Harlow, Sheering..... ...	·78	,,	Islay, Gruinart Schools..	·38
,,	Colchester, Lexden	·21	XVI.	Dollar.....	·70
,,	Rendlesham Hall	·30	,,	Balquhidder, Stronvar...	·85
,,	Diss	...	,,	Ballinluig	·62
,,	Swaffham	·70	,,	Dalnaspidal H.R.S.....	1·27
V.	Salisbury, Alderbury ...	·30	XVII.	Keith H.R.S.....	1·67
,,	Bishop's Cannings	·27	,,	Forres H.R.S.	...
,,	Blandford, Whatcombe.	·28	XVIII.	Fearn, Lower Pitkerrie..	·90
,,	Ashburton, Holne Vic...	·02	,,	N. Uist, Loch Maddy ...	1·50
,,	Okehampton, Oaklands.	·07	,,	Invergarry.....	·77
,,	Hartland Abbey	·07	,,	Aviemore H.R.S.	·99
,,	Lynmouth, Glenthorne.	·08	,,	Loch Ness, Drumnadrochit	·85
,,	Probus, Lamellyn	·05	XIX.	Invershin	·39
,,	Wellington, The Avenue	·07	,,	Scourie	3·46
,,	Wincanton, Stowell Rec.	·17	,,	Watten H.R.S.....	1·63
VI.	Clifton, Pembroke Road	·30	XX.	Dunmanway, Coolkelure	·10
,,	Ross, The Graig	·18	,,	Cork, Wellesley Terrace	...
,,	Wem, Clive Vicarage ...	·32	,,	Killarney, Woodlawn ...	·29
,,	Cheadle, The Heath Ho.	·24	,,	Caher, Duneske	·15
,,	Worcester, Diglis Lock	...	,,	Ballingarry, Hazelfort...	·16
,,	Coventry, Coundon	·34	,,	Limerick, Kilcornan ...	·20
VII.	Ketton Hall [Stamford]	...	,,	Ennis	...
,,	Grantham, Stainby	·60	,,	Miltown Malbay	·55
,,	Horncastle, Bucknall ...	·77	XXI.	Gorey, Courtown House	·15
,,	Worksop, Hodsck Priory	·56	,,	Athlone, Twyford	·28
VIII.	Neston, Hinderton	·45	,,	Mullingar, Belvedere ...	·27
,,	Southport, Hesketh Park	·47	,,	Longford, Currygrane...	·36
,,	Broughton-in-Furness ...	·63	XXII.	Woodlawn	·58
IX.	Ripon, Mickley.....	·42	,,	Crossmolina, Enniscoe ..	·93
,,	Melmerby, Baldersby ...	·46	,,	Collooney, Markree Obs.	·96
,,	Scarborough, Obs.	·85	,,	Ballinamore, Lawderdale	1·15
,,	Middleton, Mickleton ...	·49	XXIII.	Lough Sheelin, Arley...	·37
X.	Haltwhistle, Unthank...	·55	,,	Warrenpoint.....	·17
,,	Bamburgh	·89	,,	Seaforde..	·25
,,	Keswick, The Bank	·74	,,	Belfast, Springfield	·84
XI.	Llanfrechfa Grange	...	,,	Bushmills, Dundarave..	1·07
,,	Llandovery	·05	,,	Stewartstown	·67
,,	Castle Malgwyn	·17	,,	Killybegs	...
,,	Builth, Abergwesyn Vic.	·11	,,	Lough Swilly, Carrablagh	1·27
,,	Rhayader, Nantgwillt...	·11			

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MAY, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	·14	— 1·76	·12	21	3	78·9	29	36·1	4	0	5
II.		Maidstone (Hunton Court)...	·32	— 1·06	·18	21	3	...	...	...	...	..	...
„		Strathfieldsaye	·26	...	·16	21	3	...	...	...	...	...	...
III.		Hitchin	·32	— 1·63	·22	21	3	77·0	12	31·0	1	2	...
„		Winslow (Addington)	·31	— 1·79	·23	21	3	77·0	18*b*	29·0	2	4	6
IV.		Bury St. Edmunds (Westley)	·61	— 1·14	·38	20	5	71·0	18	34·0	1	0	...
„		Norwich (Brundall)	·73	...	·35	20	7	76·0	14	34·2	5	0	9
V.		Weymouth(LangtonHerring)	·15	— 1·46	·11	21	3	72·0	12	37·0	3	0	...
„		Torquay (Cary Green)	·03	...	·03	21	1	72·1	29	40·0	1	0	0
„		Polapit Tamar [Launceston]..	·07	— 1·76	·07	21	1	76·4	12	30·0	4	2	3
VI.		Stroud (Upfield)	·29	— 1·75	·22	21	5	76·0	31	37·0	2, 3	0	...
„		ChurchStretton(Woolstaston)	·29	— 2·58	·08	21	6	74·0	12*c*	34·5	1	0	4
„		Tenbury (Orleton)	·32	— 2·23	·16	20	4	79·1	12	30·5	4	2	7
VII.		Leicester (Barkby)	·64	— 1·33	·54	21	5	79·0	12*c*	23·0	1	7	14
„		Boston	·69	— 1·03	·30	21	9	85·0	12	31·0	1	2	...
„		Hesley Hall [Tickhill].....	·52	— 1·52	·39	21	6	78·0	12	29·0	3	4	...
VIII.		Manchester(PlymouthGrove)	·60	— 1·75	·42	21	5	80·0	12	33·0	1	0	1
IX.		Wetherby (Ribston Hall) ...	·50	— 1·45	·45	23	2	...	...	...	...	...	...
„		Skipton (Arncliffe)	·74	— 2·98	·44	19	6	...	...	...	...	...	...
„		Hull (Pearson Park).	·62	— 1·26	·31	21	7	77·0	12	31·0	2	1	6
X.		Newcastle (Town Moor)	·71	— 1·04	·31	21	5	...	...	...	...	...	...
„		Borrowdale (Seathwaite).....	1·17	— 7·44	·61	19	5	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	·14	— 2·71	·08	13	3	...	...	...	...	...	...
„		Haverfordwest	·06	— 2·30	·06	21	1	75·9	12	30·2	2	2	7
„		Aberystwith (Gogerddan) ...	·78	...	·38	18	3	74·0	11	...	...	...	...
„		Llandudno.....	·53	— 1·40	·25	21	3	72·0	12	37·0	1	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	·68	— 1·84	·38	18	3	79·0	11*d*	31·6	1	1	...
„		Jedburgh (Sunnyside).....	·89	— 1·01	·48	21	5	82·0	11	35·0	4	0	...
XIV.		Colmonell	·70	...	·43	18	3	79·0	11	29·0	1	...	...
XV.		Lochgilphead (Kilmory)	·95	— 2·40	·50	18	6	...	...	31·0	1	1	...
„		Mull (Quinish).....	1·52	— 1·43	·39	19	13	...	...	...	...	...	...
XVI.		Loch Leven Sluices	·60	— 1·96	·40	19	2	...	...	...	...	...	...
„		Dundee (Eastern Necropolis)	·75	— ·91	·35	21	6	80·6	11	35·5	1	0	...
XVII.		Braemar	·98	— 1·43	·40	19	8	73·3	11	32·3	4	0	13
„		Aberdeen (Cranford)	1·25	...	·57	21	11	70·0	11*d*	37·0	1	0	..
XVIII		Strathconan [Beauly]	1·26	— 1·83	·80	20	3	...	...	...	...	...	...
„		Glencarron Lodge.....	2·07	...	·77	19	13	74·0	10	34·4	1	0	...
„		Cawdor	·57	— 1·18	·22	19	8	...	...	...	...	..	...
XIX.		Dunrobin	...	...	...	...	...	...	...	...	...	...	...
„		S. Ronaldsay (Roeberry).....	1·73	+ ·01	·64	21	10	68·0	10	39·0	2	0	...
XX.		Darrynane Abbey.....	·44	...	·19	5	5	...	...	...	...	...	...
„		Waterford (Brook Lodge) ...	...	...	...	...	...	...	...	...	...	...	...
„	IRELAND.	O'Briensbridge (Ross)	·26	...	·06	18*a*	5	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	·12	— 2·22	·10	19	2	...	..	...	...	...	...
„		Dublin (FitzWilliam Square)	·19	— 1·74	·08	18	7	71·8	29	36·2	1	0	1
XXII.		Ballinasloe	·24	— 2·45	·08	4	6	75·0	13	28·0	1	1	...
„		Clifden (Kylemore)	1·44	...	·43	18	6	...	...	...	...	...	...
XXIII		Waringstown	·30	— 2·14	·16	18	5	80·0	26	33·0	2	0	3
„		Londonderry (Creggan Res.).	1·09	— 1·43	·32	4	10	...	...	...	...	...	...
„		Omagh (Edenfel)	·85	— 1·62	·32	18	5	76·0	12	31·0	1	1	1

+Shows that the fall was above the average ; —that it was below it.

a—and 23. *b*—and 29. *c*—and 18, 19. *d*—and 12.

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METEOROLOGICAL NOTES ON MAY, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder: L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

HITCHIN.—This year has yielded the driest five months in the record, which commenced in 1850, R only 5·22 in., of which 3·08 in. fell in March.

ADDINGTON.—The least May rainfall registered in 25 years. From the 1st to the 18th not a drop of R fell, and from April 17th to May 19th only ·06 in. Prevailing winds N.E. One very heavy peal of T on the 20th, and Steeple Claydon Church struck by L. Drought getting very serious at the close of the month.

BURY ST. EDMUNDS, WESTLEY.—A dry month, with harsh winds and almost continuous drought. The rain of the 20th was very partial, many places near having very little. The hay crop is likely to be very short, and if R does not come soon it will be very serious for all crops. T on 13th and 20th.

NORWICH, BRUNDALL.—A very dry month, and rain greatly wanted at the close. An unusual prevalence of N.E. winds, and great range of temp. on some days. On the 12th the temp. fell 23 degrees between 4.30 p.m. and 8.30 p.m., and on the 14th it rose from 34°·4 in the morning to 76° in the afternoon, or a range of 41°·6 in the day; being the greatest diurnal range since observations commenced in 1883. H on 1st and 20th; T at 6 p.m. on 12th; solar halo and faint parhelion at 6.30 p.m. on 6th.

WEYMOUTH, LANGTON HERRING.—The smallest R in any May since 1875, and only 5·00 in. has fallen since the beginning of the year. This is the smallest amount of R for the first five months of the year in 22 years, and is only ·48 per cent. of the average. The mean 9 a.m. temp., 56°·8, is 2°·9 above the average of 24 years, and, with the exception of 1889 and 1893, is the highest in that period. This is the seventh month in succession in which the temp. has been above the average. The drought is beginning to be seriously felt in this neighbourhood, and there has been very little dew. T on the 20th; fog on the 14th; a gale on the 19th; lunar halo on 21st.

TORQUAY, CARY GREEN.—R 2·04 in. below the average. Mean temp. 56°·1, or 3°·0 above the average. Duration of sunshine 296 hours 45 minutes, being 77 hours 5 minutes above the average; no sunless day.

POLAPIT TAMAR [LAUNCESTON].—A most unseasonable month, though fine throughout. The driest month recorded here for over 15 years, and the total for the first five months of the year is 2·24 in. below the average. Fog on the 15th.

WOOLSTASTON.—A warm but exceedingly dry month, with very cold nights. The want of water was severely felt, and the prospects of the hay crop are ruined. R fell very slightly on 6 days only. H and vivid L on the 20th. Mean temp. 54°·7.

TENBURY, ORLETON.—The driest month of May recorded here in 66 years, with the exception of May, 1844, in which month the same quantity of rain fell as this month. The weather was generally bright, with a large percentage of N. and N.E. wind, but the temp. of the month was 2°·5 above the average of 35 years. T on 13th, 18th, and 20th; H on 20th. Temp. above 70° on 9 days.

LEICESTER, BARKBY.—The country looking beautiful, but very dry. Hot days, but chilly nights. Constant N. E. winds. Prospect of fruit destroyed by sharp frost on 1st. First swift seen on 9th. Mean temp. 53°.

WALES.

HAVERFORDWEST.—The rain that was anxiously looked for at the end of April has never come. Excepting 1859 (when no rain fell) this is the driest May in my record, which dates back to 1849. I cannot obtain any record of

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May, 1831, but well remember the brightness, absence of E, and heat of that year. Barley in some places has not come up. Except fields that were shut up over the winter, hay crops will be a total failure; currants and fruit generally have withered on the trees, and on shallow lands vegetation is completely burnt up. General character of the days bright, cloudless, and hot, with winds mostly from N.E.; the nights cool, calm, and cloudless, with an unusual number of ground frosts. High bar. throughout the month. Every tree, shrub, and flower so forward that when June comes there will be nothing to come into bloom.

ABERYSTWITH, GOGERDDAN.—Very bright and dry throughout the month, with N.E. winds.

SCOTLAND.

CARGEN.—Exceptionally fine during the month, and unusually warm, very slight rainfall and a large amount of sunshine having been recorded. A notable feature was the high bar. pressure; the mean, 30·203 in., a "record" for May, has only once been exceeded in any month during 37 years (30·332 in. in February, 1891). On only one day (the 27th) was the bar. below 30 inches during the whole 24 hours. The mean bar. pressure of the first five months of this year has reached the unparalleled figure of 30·007 in. The mean temp., 54°·8, is 4° above the average, and the highest recorded in May, the nearest approach to it being 54°·5 in 1889. An unusually warm period prevailed during the 13 days 6th to 18th, when the mean temp. was 57°·5; on the 11th and 12th, the extraordinary high max. of 79° was reached, only exceeded in May, 1864, when on the 18th and 19th 81° and 82° respectively were registered. The range of temp. for the three days 10th to 12th exceeded 34°, and on the 11th was 36°·8; the nights being generally very clear, radiation produced low minima. The somewhat high difference (4°·4) between the readings of the dry and wet is an indication of the very dry state of the atmosphere. The R of the month, ·68 in., has only twice been lower during May, viz., ·60 in. in 1876, and ·06 in. in 1894. Only once, in 1881, when 295 hours were recorded, has this month's amount of sunshine—291 hours—been exceeded. The wind was very light, Easterly and Northerly prevailing for 24 days. Vegetation not so far advanced as the mild winter seemed at one time to promise. Flowering trees and shrubs fully three weeks earlier in bloom than last year.

JEDBURGH, SUNNYSIDE.—The rainfall of the month was remarkably small, E. and N.E. winds prevailing. The day temp. was high, but that of the night low, falling to 36° several times. Vegetation was wonderfully fresh, but the drought began to be felt at the close. The hawthorn was most luxuriant, more so than for a long period. Garden fruits of all kinds very promising.

COLMONELL.—Rainfall 1·84 in. less than the average of 19 years. Mean temp. 54°·1.

LOCHGILPHEAD, KILMORY.—Remarkable for drought, May being often a very wet month. Temp. very variable; a good deal of Northerly wind.

S. RONALDSAY, ROEBERRY.—A fine month, with average rainfall. Mean temp. 50°·5.

IRELAND.

DARRYNANE ABBEY.—The driest month registered here, the next driest being November, 1879, with ·75 in. on 9 days. Very hot also, with light winds and very calm sea.

O'BRIENSBRIDGE, ROSS.—The smallest rainfall here in any month for 50 years, the next to it being May, 1859, with ·34 in. A most beautiful month, with many very warm days, and some slight frosts.

DUBLIN.—A beautiful month, very similar to May, 1895—bright and dry, without any severe night frosts. The amount of cloud is very low, 4·3. The mean temp., 55°·2, is 3°·2 above the average. In the thirty-one years ending with 1895, May was coldest in 1869 (48°·2) and warmest in 1893 (56°·7). Solar

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halos were seen on the 13th, 21st, and 24th. Lunar halos on the 9th, and aurora on the 2nd. High winds occurred on 3 days, attaining the force of a gale (from N.N.W.) on the 20th.

OMAGH, EDENFEL.—A very fine month, the cool polar winds of the first week having speedily given way to a week of hot summer weather, when on the 12th the highest shade temp. ever registered here so early in May was recorded. The third week was cool, with considerable rainfall, but no frost, and the remainder of the month was fine, dry, and generally clear. These conditions, following the mild winter, have resulted in foliage and flower of phenomenal luxuriance, both on forest trees and flowering shrubs.

MARSH GAS UNDER ICE.

PROFESSOR IRA REMSEN describes a curious case of the accumulation of marsh gas under ice. A number of skaters were on a large artificial lake covered with ice. In places white spots were noticed in the ice, suggesting air bubbles. A hole was bored in the ice and a match applied. The thin jet of flame burst up, and the gas was found to be marsh gas, formed by the decomposition of organic matter at the bottom of the lake. Professor Remsen suggests that skating ponds illuminated by natural gas are among the possibilities of the future.—*Science.*

THE FLOATING ISLAND IN DERWENTWATER.

The foregoing paragraph is of interest as a contribution towards the facts respecting floating islands. It is curious that Prof. Remsen's lake should give off gas at so low a temperature. We do not expect to see Derwentwater illuminated as the Prof. suggests, because there the generation of gas is slight, except at temperatures at which ice could not exist.

A HIGH-LEVEL OBSERVATORY.

THE Assistant Government Geologist of Victoria, Mr. James Stirling, has just completed the erection of a high-level meteorological observatory at Mount St. Bernard, 5,000 ft. above sea-level. "This," writes the Melbourne *Age*, "is the highest altitude in Australia at which systematic weather observations have been taken. The instruments sent up by the Government Astronomer, Mr. Baracchi, have been placed in charge of Mr. Ellis, of the Hospice, who has been fully instructed in their use by Mr. Stirling. Thermometers, barometer, hygrometers, wind and rain gauges, and other instruments have been supplied. Mr. Stirling has also completed a series of observations on the deepest mines, as Lansell's 180, at Bendigo, over 2,000 ft. below sea-level. These observations on underground temperature, pressure of air, &c., will enable a comparison to be instituted with the recent researches of Professor Agassiz, in America, on the rate of increase of temperature with depth, and also be valuable for determining the best methods of ventilating mines at deep levels."—*Adelaide Advertiser.*

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXVI.] JULY, 1896. [PRICE FOURPENCE, or 5s. per ann. post free.

THE INTERNATIONAL CLOUD ATLAS.*

DURING the last quarter of a century, many thousands of photographs of the clouds have been taken by dozens of experts. We did think of enumerating some of the best known workers, but the list would be too long, and would go nearly through the alphabet from Abercromby to Wilson Barker—perhaps even before the one and after the other—so we desist. We naturally expect to see some result from all this work, and cloud literature is growing proportionally.

The publication now before us has, therefore, to reach a very high level in order to occupy a position worthy of the auspices under which it appears, and of the year in which it is published. Some day, some one will, we hope, give a chronological list of all published works on, and illustrations of, cloud formation. We can here take only a few, and, turning them over, state our impressions of the *International Atlas* in comparison with each.

First, of what may be called the modern publications, is M. Weilbach's *Nordeuropas Skyformer* (Copenhagen, 1881), and we are very glad to see that fourteen years later M. Weilbach was elected as a member of the committee to which we are indebted for the new atlas now before us. He can hardly fail to be gratified at the progress which has been made along the lines which he laid down.

About ten years later, came the *Wolken Atlas* (1890) of Drs. Hildebrandsson, Köppen and Neumayer. Had there been more blue and less brown in the colouring of this atlas, it would, we think, have been better received than it was—the forms on some of the plates are very good. Plate 1 (Cirrus) seems to us better than anything in the new atlas. Plate 5 (Alto Stratus) is reproduced in the new atlas as Fig. 7. Plate 9 (Cumulo Nimbus) and its equivalent Fig. 23 in

* The International Meteorological Committee.—International Cloud Atlas, published by order of the Committee by H. Hildebrandsson, A. Riggenbach, L. Teisserenc de Bort, members of the Clouds Commission. Paris: Gauthier-Villars, 1896. 4to, 31 pages; 14 sheets of coloured maps.

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the new atlas, each seems to us damaged by the characteristic tone of the respective atlasses. Plate 9 is too grey and Fig. 23 too blue — the forms agree very well. Plate 10 (Stratus) is, we think, better than its equivalent, Fig. 28—we do not know whence the latter gets the colour of the sea. The rest of the illustrations are, we think, all surpassed in the new atlas.

Third in the series comes the *Wolkentafeln* of Dr. Karl Singer (1892), who, like M. Weilbach, has been assisting in the issue of the new atlas. These were all from photographs, and the reproduction was well done. Some are reproduced in the new atlas, and the others are supplanted by better ones.

Fourth, appeared the *Classificazion delle Nubi*, issued in 1893 by the Specola Vaticana, under the direction of Padre Denza, and illustrated by the excellent reproductions of some of Signor Mannucci's photographs. This beautiful work is unique in one respect, viz., that it is not a collection of photographs by various artists, but it gives solely those taken at the observatory at the Vatican. We are sorry that not one of these has been adopted for the new atlas, as whether their nomenclature be or be not perfect, there is, we think, no doubt that several are extremely typical and true to nature, *e.g.*, Tav. viii., Strato-Cumoli 2, and Tav. xi., Nembi 2.

Fifthly and lastly, we come to the work of one who has but lately gone from us—Clement Ley's *Cloudland*, 1894. The coloured illustrations, though probably costly, do not seem to us truthful or happy, but the small reproductions of some of Mr. A. W. Clayden's photographs are very charming. We prefer his Cumulo Nimbus (pp. 87 and 89) to the Figs. 18 and 22 in the new atlas; but doubtless the opinion of the distinguished experts whose work we are noticing is preferable to ours.

And now for a few words in conclusion.

The atlas is very lovely and very cheap; we can, therefore, strongly recommend our readers to procure a copy. In the early plates the sky is more blue than we generally get in London, but that is our misfortune, not the fault of the atlas.

We think that in another edition the paper upon which the plates are printed should be stiffer; these, we fear, will not stand hard use.

We are not sure that the changes of style between several of the plates are advantageous; *e.g.*, an Alto Stratus Fig. 7 is not necessarily brown, nor we believe is a Strato-Cumulus necessarily a night cloud.

Although not one of the 28 reproductions of clouds is from an English photograph, our countrymen may well be content to see how largely the International System of 1896 is based upon the work of Howard, and that the classification adopted is that of the joint work of Dr. Hildebrandsson and their own countryman, the Hon. Ralph Abercromby.

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THE WORST GALE OF THE 19TH CENTURY IN THE ENGLISH MIDLANDS.

To the Editor of the Meteorological Magazine.

SIR,—The following notes as supplemental to your report in the May and June numbers may be worth consideration.

I travelled to Ramsgate on the afternoon of March 23rd. From Faversham onwards heavy banks of cloud, rolling over the hills from the Channel, already indicated coming trouble; though over the Thames Estuary and to the north all was bright and clear.

The night was quiet, with a little drizzling rain. At 9 a.m. it was perfectly calm. Soon afterwards the wind suddenly rose from S.W., and by 11 as high a sea was running up Ramsgate Pier as I have ever seen there in many years.

I had occasion to go to Upper Deal, and for want of train service had to drive to Minster. It was as much as we could do to get there in the teeth of the wind. There at noon the storm was raging across the flats of the Stour Valley. I arrived by train at Deal at 12.30, and from then till 1 p.m. the gale was at its height. It took me that half-hour to walk the mile to Upper Deal, struggling with the wind and barely keeping my feet, and sometimes blown against a wall and drenched with rain.

By 1.30 the sun burst out, by 2 p.m. all was calm, and there was no return of the gale. In the quiet of a bright spring afternoon I returned to Ramsgate by 4 p.m., noting on my way trees uprooted and havoc in the farmsteads; but having to return to London that night, I had no time to ascertain details.

Comparing these facts with your map facing p. 65, is is plain that my storm was, though parallel to, well in advance of the Midland gale. While I was experiencing the height of the former at Deal, the latter had only reached Bristol; or, measured parallel to your axis, was 140 miles behind; or, expressed in time, my storm reached the longitude of Cambridge, measured in the same way, 2 hours before the other.

Obviously, therefore, they were quite distinct; but it would be interesting to know whether there was a similar earlier storm on the north side of the main axis; so that the Midland gale might be attributed to the filling up of a vacuum caused by the two precursors.

I note that you have not been supplied with the time of the happening of the damage reported from Shropshire and Staffordshire.

A fortnight later I was at Malvern, and saw the damage spoken of by Mr. Pringle on p. 68. The path of the blast that did the mischief was quite apparent. In a direct line, not appreciably differing from a parallel to that of the "path" on your map, it shot downwards from the summit of the Worcestershire Beacon (1,395 ft.) to a belt of trees near the bottom of Rushy Valley (755 ft.), through which it cut a track, several trees being broken off short about 6 ft. or 8 ft. above the ground; and then it fell on the Priory Church

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and Knotsford Lodge (400 ft.). The summit of the Beacon is, measured horizontally, 3,000 ft. from the Priory, so that the wind was deflected downward at an inclination of 1 in 3, or an angle of 18°. Measurements to the belt of trees give the same results.

Yours obediently,

JAMES G. WOOD.

115, *Sutherland Avenue, W. July 4th*, 1896.

THE SPRING DROUGHT OF 1896.

DURING the last two or three months there has been much talk of drought, but as at the end of May it was at its greatest intensity, we left its consideration until the June returns were received.

It is frequently difficult to obtain by ordinary methods a just appreciation of natural phenomena, and we have had considerable difficulty in arriving at a clear idea of, and in exhibiting in tabular form, the intensity of the drought. One reason of this is given in a remark of the veteran observer, Mr. Southall of Ross: "We have had two periods of partial drought, with a period of 45 days slightly below average, between them." Normally, we should have expected the period dividing two droughts to have more than the average fall. Again, in working with the records for the half-year, the two-month periods, January and February and April and May, were dry, but not unprecedentedly so, and were separated by a wet March, and followed by a June of irregular amounts, but generally wet, except over central and western England.

In preparing the following table, 28 stations were selected for their fair geographical distribution over the kingdom, and should therefore give reliable results for the country generally.

Dealing first with the rainfall of the half-year, we see that at eight out of the sixteen English and Welsh stations the total fell below 67 per cent., or two-thirds of the average, the lowest values being 48 per cent. at Haverfordwest, Pembroke, 52 per cent. at Orleton, Worcestershire, 55 per cent. at Weymouth, and 56 per cent. at Hesley Hall, Notts, while at Bury St. Edmunds the fall was 10 per cent. above the average. In the *Met. Mag.* for July, 1895, we showed that the rainfall of the driest first six months should be about 50 per cent. of the average; the above-mentioned stations therefore show a six months' drought of extreme severity, but the average of the whole 16 stations shows a deficiency of only 30 per cent., an amount by no means phenomenal.

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Div.	Station.	First Half of Year.			April & May.		
		Average	1896		Average	1896	
			Total.	% of Aver		Total.	% of Aver
		in.	in.		in	in.	
I.	London, Camden Square	10·76	7·24	67	3·64	·69	19
II.	Alton, Ashdell	13·60	10·81	79	4·16	·71	17
III.	Winslow, Addington.....	11·57	7·36	64	4·02	1·14	28
IV.	Bury St. Edmunds, Westley..	9 78	10·78	110	3·41	1·46	43
V.	Weymouth, Langton Herring.	12·56	6·91	55	3·49	·82	23
,,	Polapit Tamar [Launceston]...	15·08	8·97	59	4·05	·90	22
VI.	Tenbury, Orleton	13·94	7·23	52	4·63	1·44	31
VII.	Boston	9·93	6·89	69	3·43	1·44	42
,,	Hesley Hall [Tickhill]	10·84	6·02	56	3·75	1·22	33
VIII.	Manchester, Plymouth Grove.	13·44	11 22	83	4·06	2 29	56
IX.	Wetherby, Ribston	11·22	6·81	61	3·80	1·19	31
X.	Newcastle, Town Moor.....	11·06	7·98	72	3·58	1·47	41
,,	Seathwaite	57·65	53·60	93	15·75	6 84	43
XI.	Cardiff, Ely	17·15	11·34	66	5·26	1·15	22
,,	Haverfordwest	19·33	9·35	48	4·99	1·22	24
,,	Llandudno	11·79	10·42	88	3·74	1·88	50
XII.	Cargen [Dumfries]	17·42	14·97	86	4·75	2·66	56
,,	Jedburgh, Sunnyside.....	10·53	8·19	78	3·60	1·63	45
XV.	Lochgilphead, Kilmory.....	25·05	26·73	107	6·16	5·26	85
XVI.	Dundee, Eastern Necropolis..	11·68	7·20	62	3·71	1·60	43
XVII.	Braemar	15·51	10·06	65	4·83	2·03	42
XVIII.	Cawdor [Nairn]	11·11	11·19	101	3·27	2·14	65
XXI.	Carlow, Browne's Hill	14·81	9·01	61	4·62	·70	15
,,	Dublin, Fitzwilliam Sq.	11·93	7·85	66	4·05	1·07	26
XXII.	Ballinasloe	15·82	11·46	72	5·03	1·26	25
,,	Crossmolina, Enniscoe	21·84	19·41	89	5·98	3·01	50
XXIII.	Waringstown	14·38	10·94	76	4·86	1·58	33
,,	Londonderry, Creggan Res....	16·36	18·92	116	4·76	4·12	87

For the Scotch and Irish stations the averages work out at 83 per cent. and 80 per cent. respectively, and do not in any instance fall to 60 per cent. of the average.

Turning now to the second portion of the table, containing the results for April and May, we find three stations with less than 20 per cent. of the average, *i.e.*, Carlow, Browne's Hill, 15 per cent., Alton, Ashdell, 17 per cent., and London, Camden Square, 19 per cent. These instances certainly give small totals, but in each case the rainfall exceeded the partial drought limit of ·01 in. per diem, while in 1893 there were dozens of stations at which partial drought lasted for more than 100 days. In connection with this we may mention that we tabulated the absolute and partial droughts for 28 stations well distributed over the three kingdoms, but the results were not of sufficient importance to justify their publication in full, the absolute drought extending to three weeks at only three stations. The partial drought reached or exceeded 50 days at four stations in England and two in Ireland:—

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London, Camden Square.....	51	days	ending	June	2nd,	rain ·46 in.
Alton, Ashdell	50	,,	,,	,,	3rd,	,, ·45 ,,
Weymouth, Langton Herring...	51	,,	,,	,,	3rd,	,, ·40 ,,
Launceston, Polapit Tamar ...	52	,,	,,	,,	4th,	,, ·49 ,,
Cork, Wellesley Terrace	64	,,	,,	,,	1st,	,, ·63 ,,
Dublin, Fitzwilliam Square ...	60	,,	,,	,,	15th,	,, ·58 ,,

Of these by far the most remarkable is the 64 days at Cork.

Leaving now results based on geographical distribution to represent the country as a whole, and selecting the individual stations which give the most striking results, we find that out of a little over three hundred returns received, 53, set out in the following table, recorded less than two-tenths of an inch of rain in May, while for April and May together four stations recorded less than half an inch, viz.: Torquay, Cary Green, ·13 in.; Plymouth, ·29 in.; Ashburton, Druid House, ·35 in.; Caher, Duneske, ·43 in.

Total Rainfall in May, 1896.

I.	London, Strand.....	·14	V.	Wellington, The Avenue*	·07
,,	,, Camden Square...	·14	,,	Templecombe, Stowell Rec.	·17
,,	,, Randolph Gardns.	·18	VI.	Lechlade	·15
,,	Lea Bridge.....	·19	,,	Ross, The Graig	·18
II.	Wallington.....	·15	,,	Stourport, Lincombe Lock	·15
,,	Hythe	·17	XI.	Cardiff, Ely	·14
,,	Sevenoaks, Kemsing	·15	,,	Treherbert, Tynywaun ...	·13
,,	St. Peter's.....	·08	,,	Llandovery	·05
,,	Sheppey, Leysdown.....	·12	,,	Haverfordwest, High St...	·06
III.	Goring.....	·18	,,	St. Bride's Bay, Penycwm.	·06
,,	Oxford, Magdalen College.	·19	,,	CastleMalgwyn [Llechryd]	·17
IV.	Southend, Water works ...	·19	,,	Tregaron Vicarage	·18
V.	Marlborough, Mildenhall..	·19	,,	Builth, Abergwesyn	·11
,,	Weymouth, Langton Herrg.	·15	,,	Rhayader, Tyrmynydd ...	·13
,,	Plymouth	·01	,,	,, Nantgwillt	·11
,,	Torquay, Cary Green.....*	·03	,,	Lake Vyrnwy	·19
,,	Ashburton, Holne Vic. ...	·02	XX.	Dunmanway, Coolkelure..	·10
,,	,, Druid House..	·01	,,	Cork, Wellesley Terrace..*	·14
,,	Tavistock, Rose Villa	·09	,,	,, St. Ann's Hill.....	·14
,,	Polapit Tamar [Launceston]	·07	,,	Waterville, Iveragh Lodge	·17
,,	Okehampton, Oaklands ...	·07	,,	Caher, Duneske .....*	·02
,,	Tiverton, St. Peter St.....	·05	,,	Ballingarry, Hazelfort.....	·16
,,	Hartland Abbey	·07	XXI.	Gorey, Courtown House..*	·15
,,	Barnstaple Athenæum.....	·05	,,	Carlow, Browne's Hill.....	·12
,,	Lynmouth, Glenthorne ...	·08	,,	Dublin, Fitzwilliam Sq. ...	·19
,,	Probus, Lamellyn	·05	XXIII.	Warrenpoint, Sumner Hill.	·17
,,	Liskeard, Wadeland Ter..	·04			

* Total Rainfall in April less than ·50 in.

It will be seen that out of the 53 stations in the table, 31 are in Divisions V., VI., and XI., that is, in the S.W. quarter of England and the southern half of Wales, districts for the most part decidedly wet, and where such falls are much more remarkable than they would be in the Eastern Counties, while nine are from southern Ireland, also a wet region.

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The longest droughts yielded in these districts are—

		Absolute.	Partial.
V.	Torquay, Cary Green	26 days	75 days.
,,	Ashburton, Druid	22 ,, ...	69 ,,
,,	,, Holne Vicarage	21 ,, ...	67 ,,
,,	Wellington, The Avenue	20 ,, ...	65 ,,
VI.	Lechlade	19 ,, ...	69 ,,
XI.	Haverfordwest	22 ,, ...	51 ,,
,,	St. Bride's Bay, Penycwm	21 ,, ...	51 ,,
XX.	Caher, Duneske	none	66 ,,
,,	Cork, Wellesley Terrace	none	64 ,,

Referring again to 1893, we find partial droughts of 76 days at Torquay, 78 days at St. Austell, 78 days at Ross, Herefordshire, and 73 days at Haverfordwest, showing clearly that in S.W. England and S. Wales the drought was more severe in 1893 than in 1896, but the 1896 drought in the south of Ireland appears to be altogether unprecedented, for we can find no previous record of partial drought in that region prevailing for more than 45 or 46 days.

We conclude with a few notes from our regular correspondents, and one or two extracts from the press :—

Kensington, Edith Road.—Absolute drought for 32 days, April 18th to May 19th. G. VON U. SEARLE.

London, Strand.—From April 18th to June 2nd, rain was registered on only three days—April 30th, ·04 in. ; May 22nd, ·12 in. ; May 23rd, ·02 in. J. H. STEWARD.

Muswell Hill.—The total R of the six months January to June is 6·98 in., being 4·81 in., or over 40 per cent., less than the average. S. G. ABETHELL.

Finchley, Etchingham Park.—From April 17th to June 3rd, 48 days with only ·34 in. of R. J. W. SCOTT.

Dorking, Abinger Hall.—The total rainfall for the half-year is under ten inches, which is very little. G. PAYNE.

Tenterden.—The drought is serious. Absolute drought for 20 days, April 30th to May 19th. Partial drought 57 days, April 5th to May 31st; rainfall ·56 in. Total in May ·21 in., and in April and May ·75 in. June, however, has been the wettest for 34 years, and has given us 3·95 in., chiefly in five heavy falls, viz. : 4th, ·21 in. ; 9th, ·60 in. ; 10th, 1·26 in. ; 24th, 1·10 in. ; 29th, ·40 in. J. ELLIS MACE.

Tunbridge Wells, Camden Park.—Absolute drought for 18 days, between May 1st and 20th, and partial drought for 33 days, with ·33 in. of R between January 27th and March 1st. Rainfall for the first five months of 1896, 5·44 in. ; average for 12 years, 10·28 in. J. WESTON.

Maidstone, Debtling.—My well, 100 feet deep in the chalk, is now (June 4th) lower than I have ever known it at this time of year, having only 9 ft. 6 in. of water in it, while it generally has from 13 ft. to 20 ft. Absolute drought for 17 days, ending May 19th, and partial drought for 29 days, with ·21 in. of R, ending May 31st. R. COOKE.

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Sheppey, Leysdown.—Total R for June, 3·13 in., or only ·11 in. less than in the previous five months. A. FARBROTHER.

Slough, Upton.—The R for the half-year (6·23 in.), despite a wet March, is less than half the normal quantity. R. BENTLEY.

Amersham, The Plantation.—Absolute drought for 33 days, from April 18th to May 20th inclusive. G. WELLER.

Plymouth.—Absolute drought occurred from April 25th to May 21st, and in 69 days, ending May 30th, only ·65 in. of R fell. H. VICTOR PRIGG.

Ashburton, Holne Vicarage.—R from January 1st to June 30th only 14·71 in., 7·51 in. less than the average of the corresponding period of the preceding six years. J. GILL.

Clifton, Pembroke Road.—R of the first six months of the year only 6·98 in., being nearly 8·00 in. less than the average of 40 years. R. F. STURGE.

Ross, The Graig.—The rainfall for the five months ending May 31st, 1896, is only 3·84 in., or 7·98 in. less than the average of the ten years 1880-89. The following are the amounts registered in Herefordshire in the first five months of the ten driest years since 1818 :—

1896 3·84 in.	1870 7·23 in.	1854 7·26 in.	1892 7·55 in.	1863 7·72 in.
1893 7·11 ,,	1864 7·23 ,,	1855 7·31 ,,	1832 7·65 ,,	1839 7·72 ,,

Although the fall in 1896 is much less than in 1893, there was in the latter year a period of 73 days with only ·33 in. of R. This year we have had partial drought for 62 days, ending February 29th, and for 50 days, ending June 3rd. H. SOUTHALL.

Rotherby Hall.—Total rainfall for five months, ending May 31st, 1896, 5·11 in., the smallest since 1868, and 3·01 in. less than in the corresponding period of 1895. J. HAMES.

Neston, Hinderton.—Rainfall, January to June, 1896, 11·20 in. Average, January to June, 1869-95, 11·07 in. R. BUSHELL.

Bolton, The Park.—Rainfall of the first six months of 1896, 16·67 in.; average for the same period for ten years, 14·98 in. W. W. MIDGLEY.

Duddon Valley, Ulpha Vicarage.—The R of the six months ending June is in excess of the average by 1·48 in. W. KEWLEY.

Dunmanway, Coolkelure.—A very great scarcity of water in rivers and streams, which are lower than any one can remember them. E. A. SHULDHAM.

Cork, Wellesley Terrace.—The R of the first half of the year is 8·43 in., compared with an average of 18·66 in.; the next smallest fall was 9·57 in. in 1887. There was partial drought for 53 days, ending June 1st. W. MILLER.

SLOUGH.—June 6th.—The drought is very serious. The ponds on the high grounds are dried up, and the cattle have to be watered by carts. Hay will not be half the average, and cherries, plums, damsons, and apples have suffered.—*Daily Mail.*

DEVON.—A remarkable drought is being experienced in Devon and Cornwall, and the water supply of Plymouth and other towns has become so short that even water required for domestic purposes is only turned on for a limited period. With the exception of a slight rainfall at the beginning of last month,

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the drought has lasted since the middle of March. No such scarcity of water has been experienced since 1869. The total rainfall for the six months of the present year is less than eight inches. Agriculturists are suffering severely.—*Bristol Times and Mirror*, July 1st.

While dealing with the first six months of 1896, it seems unreasonable to entirely ignore the unusual warmth which accompanied the drought, for although our time is chiefly devoted to rainfall statistics, and we receive practically no systematic temperature records, the observations at Camden Square now extend over nearly 40 years, and we have therefore full details of the temperature of North London.

Taking first the mean shade temp. at 9 a.m., we have—

Average of 30 years,	Jan.	Feb.	Mar.	April.	May.	June.	Six months, Jan.-June.
1861-90...	38°1	39°7	41°6	48°7	55°0	61°2	47°4
1896	40·3	38·9	45·8	50·2	55·7	64·8	49·3
Difference	+2·2	—·08	+4·2	+1·5	+0·7	+3·6	+1·9

It will be seen that the mean for the six months is 1°·9 above the average, and that only in February was the temperature below the average.

In recent years, 1878, 1884, and 1893 appear to have been the warmest, and we therefore give similar results for those years, from which it will be seen that the mean for the first half of 1896 is half a degree above that of the next warmest year, *i.e.*, 1893 :—

Mean shade temp. at 9 *a.m.*

	Jan.	Feb.	Mar.	April.	May.	June.	Mean.
1878	39°6	+41°6	—42°3	48°9	56°6	62°8	—48°6
1884	+43·3	+41·6	43·3	—47·0	56·7	—59·8	—48·6
1893	—35·0	40·9	44·2	+50·8	+58·9	62·5	48·7
1896	40·3	—38·9	+45·8	50·2	—55·7	+64·8	+49·3

The + and — indicate respectively the highest and lowest value for each month.

but that in only two months, March and June, was the 1896 value higher than that of the corresponding month in one of the other years, while in February and May the 1896 values are the lowest.

If we take the extreme max. in shade and min. in shade for each of the months, we have—

Absolute shade max. and shade min. in 1896.

	Jan.	Feb.	Mar.	April.	May.	June.
Max.	52°7	55°8	65°2	68°4	78°9	85°1
Min.	28·0	23·2	29·4	32·8	36·1	41·1

Number of times that the shade max. and shade min. have been higher in the 30 *years* 1861–1890.

	Jan.	Feb.	Mar.	April.	May.	June.	Mean.
Max.	21	14	4	17	15	9	13
Min.	4	19	0	4	6	19	9

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If the max. and min. had been average values, they should, of course, each have been exceeded 15 times in the 30 years, and the 13 for the max. is very near to this; the 9 for the min. is decidedly low, but not remarkably so.

The conclusion which we draw, and which we think is clearly borne out by the foregoing, is that 1896 has been marked by steady persistence of temperature slightly above the average, and not by periods of exceptionally high temp.

ROYAL METEOROLOGICAL SOCIETY.

The last meeting of this Society for the present session was held on Wednesday evening, June 17th, at the Institution of Civil Engineers, Westminster, Mr. E. Mawley, F.R.H.S., President, in the chair.

Mr. H. Harries read a paper on *Arctic Hail and Thunderstorms*, in which he showed that the commonly accepted opinion that hail and thunderstorms are almost, if not quite, unknown in the arctic regions, is incorrect. The author took the first hundred logs that came to hand, ranging over the greater part of the present century; eight were discarded owing to the letter "h" being used indifferently for hail and for haze; out of the remaining 92, 73, or 79 per cent. contained records of hail. The observations being distributed over all parts of the northern seas visited by ships.

There were in all 296 observations, one-half of which were recorded to the northward of the 66th parallel, but any discussion of the distribution throughout the different months of the year is vitiated by the fact that vessels wintering far north are very few in number, so that there is an almost complete absence of observations from November to February.

As bearing upon the question of the probability of hail in high latitudes, it is significant that not one of the observers expresses surprise indicative of the phenomenon being rare.

Turning to thunderstorms, it will perhaps be expected that the 296 records of hail would be accompanied by as many records of thunderstorms. It may be that the atmosphere was in an electrical condition with each fall of hail, but instead of about 300 observations of thunder or lightning, or both, the total number is only 59, or one-fifth of the number of hail falls. More than half the number occurred in August, but the absence of ships in winter must again be borne in mind.

The observations show that thunderstorms are at least possible in all regions from the Behring Strait, Eastward, to Davis Strait, and the East Greenland Sea.

Mr. R. H. Scott remarked that probably many of the recorded observations of hail were "graupel," and not real hail. Mr. Baldwin Latham asked if anything is known as to the height at which hail is formed, he remembered a severe storm in which he saw the stones

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three-quarters of an inch in diameter falling gently on his lawn, and no damage was done, while in the valley, 300 feet below him, every pane of glass was broken. The President, and Messrs. Inwards, Tripp, Marriott and Harding also took part in the discussion.

A paper by Mr. J. E. Cullum on the *Climatology of Valencia Island* was also read. The Observatory at Valencia, which is under the control of the Meteorological Office, is situated on the extreme south-west coast of Ireland, and is almost the most westerly point of Europe. Continuous records from self-recording instruments were carried on from 1869 until 1891, when the observatory was removed to Cahirciveen, and the author gives the results of the observations for those 23 years, dealing with the elements:—

Barometrical Pressure.	Rain.
Temperature.	Snow and Hail.
Vapour Tension.	Thunder.
Relative Humidity.	Fog.

Sunshine.

The paper being practically a summary of results, is incapable of sufficient condensation to give an adequate idea of it in these pages.

The President remarked on the very equable character of the records, and thought that greater range would have been shown by ordinary instruments exposed in the usual manner.

Mr. Balwin Latham asked if the results of the recording instruments had been compared with readings in the Stevenson screen which he saw in one of the photographs of the station.

Mr. F. C. Bayard thought that a comparison of the records at Belmullet in the N.W. of Ireland, with those at Valencia in the S.W., would be very interesting.

Mr. F. J. Brodie regretted that there was no discussion of the wind records, or of the distribution of gales throughout the year, and no attempt to correlate the results for the different elements. He noticed that thunderstorms were most frequent in winter, while in England they were most common in summer. The range of total annual rainfall, from 69 inches to 44 inches, struck him as very small, for in London the range in the same period was from 32 inches to 17 inches.

Mr. Sowerby Wallis considered the small variation of the rainfall very remarkable, for it is almost axiomatic that in England the rainfall of the wettest year will be roughly twice that of the driest year, and an exhaustive paper read by Mr. A. R. Binnie, C.E., before the Institution of Civil Engineers, in 1892, showed that the same rule held good for the greater part of the world.

Mr. R. H. Scott explained that the paper was entirely a discussion of the results from the self-recording instruments, and said that the comparison of the records at Valencia and Belmullet referred to by Mr. Bayard, would soon be possible, as the observations at the latter station had been worked up and would shortly be issued.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1896.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	52·7	17	28·0	29	45·4	36·5	37·8	89	72·6	24·3	·78	9	8·1
Malta	64·0	1	40·1	21	58·3	48·0	41·5	75	114·4	33·0	3·05	15	6·2
Mauritius	84·5	30	68·7	27	82·8	73·1	69·7	79	134·8	62·2	8·92	18	6·2
Calcutta	82·9	16	47·5	11	78·4	53·5	50·6	60	135·8	38·7	·03	1	3·4
Bombay	88·7	2	65·8	19	84·0	69·7	65·2	68	134·9	53·2	·00	0	0·2
Ceylon, Colombo	90·5	25	69·5	13	87·8	72·7	68·7	73	152·0	65·0	2·92	8	6·1
Melbourne	108 0	23	45·4	30	80·9	57·2	53·0	61	155·0	35·1	2·81	10	4·9
Adelaide	111·2	23	52·5	29	86·9	62·9	52·0	45	172·0	41·5	1·52	7	4·8
Sydney	108·5	13	63·2	30	81·5	68·2	62·0	70	160·9	52·3	1·66	11	5·2
Wellington	77·0	16	45·5	21	70·5	57·5	52·6	66	141·0	35·0	2·09	11	4·2
Auckland	83·0	30	53·0	21	73·7	60·0	56·8	71	144·0	50·0	·87	12	5·6
Jamaica, Kingston	89·5	3	62·7	15	84·6	67·5	65·2	76	...	...	1·51	7	3·0
Trinidad	88·0	10*a*	63·0	27	85·8	67·5	69·3	80	166·0	62·0	7·06	11	...
Grenada	85·4	30	69·2	24	81·8	72·0	68·7	79	155·8	...	4·35	15	2·3
Toronto	37·4	2	−10·5	6	27·9	15·4	20·0	84	53·5	−15·5	3·93	13	8·3
New Brunswick, Fredericton	37·9	3	−16·3	6	21·2	4·0	7·7	72	...	...	1·36	8	5·7
Manitoba, Winnipeg	34·8	10	−45·2	4	9·4	−16·8	...	...	...	...	1·03	14	5·2
British Columbia, Esquimalt	55·1	7	30·6	2	43·0	34·2	37·1	93	...	...	8·23	20	7·9

a—and 11, 13.

REMARKS.

MALTA.—Adopted mean temp. 52°·1, 0°·8 below the average. Mean hourly velocity of wind 12·4 miles. Average temp. of sea 59°·6. Thunderstorms on 25th and 26th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·9 below, of dew point 0°·1 below, and rainfall 1·59 in. above, their respective averages. Mean hourly velocity of wind 10·2 miles, or 1·1 mile below average; extremes, 26·0 on 24th, and 0·0 on 11th; prevailing direction, E.S.E. to E. by N. Lightning on 16th, 19th, and 30th, and thunder on 31st. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on the 8th. D. G. MANTELL

Melbourne.—Max. temp. in shade (108°·0 on 23rd) the highest recorded since January 19th, 1882. P. BARRACHI.

Adelaide.—Mean temp. 0°·5 above the average of 39 years; rainfall ·69 in. above the average. C. TODD, F.R.S.

Sydney.—The hottest January on record, and the 13th the hottest day in Sydney on record, and at the same time the most persistent heat. Mean temp. 4°·9 above, humidity 2·5 below, and rainfall 2·03 in. below, their respective agerages. H. C. RUSSELL, F.R.S.

Wellington.—Very strong winds from N.W. throughout the month, with occasional rain, but a small total fall. Thunder on 4th, 7th, and 8th; fog on 25th and 26th. Mean temp. 1°·4 above, and rainfall 1·82 in. below, the average. R. B. GORE.

Auckland.—A remarkably dry month, the total rainfall being hardly one-third of the average. Mean temp. slightly below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—In Kingston the weather was fine, with rainfall about the average. Mean hourly velocity of wind 3·6 miles. Rainfall of the Island one-fourth above the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 4·14 in. above the average of 30 years. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, JUNE, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall .	3·69	XI.	Lake Vyrnwy	2·87
,,	Birchington, Thor	3·76	,,	Corwen, Rhug	2·33
,,	Hailsham	3·86	,,	Carnarvon, Cocksidia ...	...
,,	Ryde, Thornbrough	2·45	,,	I. of Man, Douglas	3·19
,,	Emsworth, Redlands ...	1·77	XII.	Stoneykirk, Ardwell Ho.	4·34
,,	Alton, Ashdell	3·92	,,	New Galloway, Glenlee	3·69
III.	Oxford, Magdalen Col..	2·44	,,	Lilliesleaf, Riddell	2·28
,,	Banbury, Bloxham	2·40	XIII.	N. Esk Res. [Penicuick]	3·75
,,	Northampton, Sedgebrook	2·56	,,	Edinburgh, Blacket Pl..	3·57
,,	Alconbury	1·10	XIV.	Glasgow, Queen's Park..	4·07
,,	Wisbech, Bank House...	2·16	XV.	Inverary, Newtown	4·43
IV.	Southend	2·78	,,	Oban, The Corran	...
,,	Harlow, Sheering..... ...	2·86	,,	Islay, Gruinart Schools..	3·06
,,	Colchester, Lexden	2·01	XVI.	Dollar.....	3·88
,,	Rendlesham Hall	1·67	,,	Balquhidder, Stronvar...	5·59
,,	Diss	...	,,	Ballinluig	3·42
,,	Swaffham	2·18	,,	Dalnaspidal H.R.S.....	4·65
V.	Salisbury, Alderbury ...	1·90	XVII.	Keith H.R.S.....	3·00
,,	Bishop's Cannings	1·55	,,	Forres H.R.S.	3·13
,,	Blandford, Whatcombe .	2·44	XVIII.	Fearn, Lower Pitkerrie..	3·36
,,	Ashburton, Holne Vic...	3·22	,,	N. Uist, Loch Maddy ...	4·18
,,	Okehampton, Oaklands.	2·15	,,	Invergarry.....	3·25
,,	Hartland Abbey	1·73	,,	Aviemore H.R.S.	3·35
,,	Lynmouth, Glenthorne.	2·79	,,	Loch Ness, Drumnadrochit	3·55
,,	Probus, Lamellyn	1·24	XIX.	Invershin	3·37
,,	Wellington, The Avenue	2·83	,,	Scourie	3·98
,,	Wincanton, Stowell Rec.	1·97	,,	Watten H.R.S.....	2·46
VI.	Clifton, Pembroke Road	1·33	XX.	Dunmanway, Coolkelure	4·16
,,	Ross, The Graig	2·19	,,	Cork, Wellesley Terrace	2·17
,,	Wem, Clive Vicarage ...	1·90	,,	Killarney, Woodlawn ...	2·84
,,	Cheadle, The Heath Ho.	3·09	,,	Caher, Duneske	2·03
,,	Worcester, Diglis Lock	1·69	,,	Ballingarry, Hazelfort...	2·12
,,	Coventry, Coundon	2·72	,,	Limerick, Kilcornan ...	1·75
VII.	Ketton Hall [Stamford]	2·52	,,	Ennis.....	...
,,	Grantham, Stainby	2·99	,,	Miltown Malbay	3·01
,,	Horncastle, Bucknall ...	1·91	XXI.	Gorey, Courtown House	1.45
,,	Worksop, Hodsck Priory	4·22	,,	Athlone, Twyford	2·24
VIII.	Neston, Hinderton	4·13	,,	Mullingar, Belvedere ...	2·53
,,	Southport, Hesketh Park	1·98	,,	Longford, Currygrane...	2·99
,,	Broughton-in-Furness ...	4·20	XXII.	Woodlawn	3·36
IX.	Ripon, Mickley.....	3·30	,,	Crossmolina, Enniscoe ..	4·68
,,	Melmerby, Baldersby ...	2·86	,,	Collooney, Markree Obs.	3·46
,,	Scarborough, Obs.	1·46	,,	Ballinamore, Lawderdale	4·32
,,	Middleton, Mickleton ...	3·54	XXIII.	Lough Sheelin, Arley...	4·27
X.	Haltwhistle, Unthank...	2·35	,,	Warrenpoint.....	3·51
,,	Bamburgh	1·26	,,	Seaforde.....	3·73
,,	Keswick, The Bank	3·91	,,	Belfast, Springfield	3·67
XI.	Llanfrechfa Grange	2·51	,,	Bushmills, Dundarave..	2·99
,,	Llandovery	2·80	,,	Stewartstown	3·80
,,	Castle Malgwyn	1·05	,,	Killybegs	4·02
,,	Builth, Abergwesyn Vic.	2·72	,,	Lough Swilly, Carrablagh	3·64
,,	Rhayader, Nantgwillt ...	2·12			

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JUNE, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which '01 or more fell.	TEMPERA Max. Deg.	Max. Date	I
			inches.	inches.	in.					
I.	ENGLAND.	London (Camden Square) ...	2·27	+ ·26	·70	3	11	85·1	15	4
II.		Maidstone (Hunton Court)...	3·72	+ 2·10	1·42	10	9	...	...	
"		Strathfieldsaye	2·95	...	1·62	10	14	...	...	
III.		Hitchin	1·59	— ·27	·46	10	10	84·0	15	4
"		Winslow (Addington)	2·15	+ ·29	·54	7	14	85·0	16	3
IV.		Bury St. Edmunds (Westley)	3·20	+ 1·41	·94	10	10	76·0	15	4
"		Norwich (Brundall)	2·24	...	·89	9	8	81·0	16	3
V.		Weymouth(LangtonHerring)	1·91	— ·32	·54	8	9	79·0	14	4
"		Torquay (Cary Green)	1·97	...	·41	8	12	78·8	8	4
"		Polapit Tamar [Launceston]..	1·49	— ·72	·29	15*a*	14	83·0	15	4
VI.		Stroud (Upfield)	2·80	+ ·41	·68	5	14	83·0	15*a*	5
"		ChurchStretton(Woolstaston)	1·96	— ·59	·56	3	14	80·0	15	4
"		Tenbury (Orleton)	1·64	— ·97	·46	7	13	85·5	16	4
VII.		Leicester (Barkby)	2·05	— ·30	·38	24	14	88·0	16	3
"		Boston	1·84	— ·05	·45	16*b*	9	86·0	13	4
"		Hesley Hall [Tickhill].....	2·01	+ ·09	·63	4	12	86·0	16	5
VIII.		Manchester(PlymouthGrove)	2·50	— ·15	·40	8	15	89·0	15	4
IX.		Wetherby (Ribston Hall) ..	2·87	+ ·93	·65	8	10	...	...	
"		Skipton (Arncliffe)	4·07	+ ·71	·95	4	12	..	...	
"		Hull (Pearson Park).	2·83	+ 1·08	1·29	4	13	80·0	13*a*	
X.		Newcastle (Town Moor)	2·08	+ ·44	·61	6	16	...	...	
"		Borrowdale (Seathwaite).....	6·50	— ·08	1·19	30	18	...	...	
XI.	WALES.	Cardiff (Ely).....	2·64	+ ·21	·67	7	11	...	...	
"		Haverfordwest	1·46	— 1·10	·59	16	13	86·1	15	3
"		Aberystwith (Gogerddan) ...	2·20	...	·34	8	13	88·0	15	3
"		Llandudno.....	2·17	+ ·40	·60	4	16	80·0	15	4
XII.	SCOTLAND.	Cargen [Dumfries]	3·44	+ 1·49	·94	4	12	82·6	14	3
"		Jedburgh (Sunnyside).....	1·90	+ ·16	·65	4	12	86·0	15	3
XIV.		Colmonell	4·28	...	·76	4	15	89·0	14	4
XV.		Lochgilphead (Kilmory).....	3·75	+ ·65	·85	4	18	...	...	4
"		Mull (Quinish).....	4·82	+ 1·53	·70	19	22	...	...	
XVI.		Loch Leven Sluices.....	3·50	+ 1·75	·80	5	14	...	...	
"		Dundee (Eastern Necropolis)	2·65	+ 1·15	·40	17	21	78·0	27	4
XVII.		Braemar	3·01	+ 1·02	·65	7	19	76·2	15	3
"		Aberdeen (Cranford)	3·00	...	·50	5	22	75·0	27	4
XVIII		Strathconan [Beauly]	5·03	+ 2·54	·93	22	16	...	...	
"		Glencarron Lodge.....	7·20	...	1·10	19	23	74·1	15	4
"		Cawdor	4·49	+ 3·09	·70	10	24	...	...	
XIX.		Dunrobin	4·16	+ 2·14	·88	10	16	71·0	27	4
"		S. Ronaldsay (Roeberry).....	2·89	+ 1·13	·81	29	17	68·0	27	4
XX.	IRELAND.	Darrynane Abbey.....	2 30	...	·69	15	20	...	...	
"		Waterford (Brook Lodge) ...	1·93	— ·14	·82	16	10	82·0	15	4
"		O'Briensbridge (Ross)	2·45	...	·51	15	15	...	...	
XXI.		Carlow (Browne's Hill)	2·23	+ ·39	·86	16	10	...	...	
"		Dublin (FitzWilliam Square)	1·88	+ ·22	·70	16	14	80·8	15	4
XXII.		Ballinasloe	2·61	+ ·31	·41	3	17	78·0	14	4
"		Clifden (Kylemore)	4·23	...	·62	22	21	...	...	
XXIII		Waringstown	2·54	+ ·47	·57	16	13	88·0	14	4
"		Londonderry (Creggan Res.).	3·97	+ 1·55	·71	16	23	...	...	
"		Omagh (Edenfel)	3·39	+ ·92	·92	16	20	79·0	14*c*	4

+Shows that the fall was above the average ; —that it was below it.

a—and 16. *b*—and 23. *c*—and 15. *d*—and 5. *e*—and 25.

METEOROLOGICAL NOTES ON JUNE, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

STRATHFIELDSAYE.—Severe TS with 1·62 in. of R on 10th, but no damage done.

ADDINGTON.—Thunder was rather frequent in the early part of the month, but at no time heavy. Very hot on the 15th and 16th, followed by a great fall of temp. on the 17th, there being a difference of 18° between the max. temp. of the 16th and 17th. There was a good deal of very fine weather during the month with a good rainfall, but R was much needed at the close.

BURY ST. EDMUNDS, WESTLEY.—A favourable month for agriculture. Max. temp. below 60° on only 3 days. The storms were very partial, many places wanting rain. TSS on 3rd, 6th, 9th and 24th, distant T on the 4th.

NORWICH, BRUNDALL.—The warmest June since 1877; mean temp. 61°·7. A great many very fine days. The heavy rain of the 10th was much appreciated after the long-continued dryness. L in evenings of 2nd, 5th and 6th. T on 23rd and 24th. TSS and heavy R on 10th.

WEYMOUTH, LANGTON HERRING.—Mean 9 a.m. temp. 62°·6, or 2°·3 above the average, with the exception of 1878, when it was 63°·6, the highest for 25 years; TSS on the 4th and 26th, and distant T on the 14th and 15th, which were very hot days. Solar halo on the 12th, and fog on the 16th. Rainfall for the six months ending July 1st 6·91 in., or only 55 per cent. of the average; with the exception of 1892, the smallest fall for the first six months of the year since 1875.

TORQUAY, CARY GREEN.—R ·31 in. below the averege. Mean temp. 61°·3, or 2°·5 above the average. Duration of sunshine 265 hours 45 minutes, being 33 hours 10 minutes above the average; no sunless day.

POLAPIT TAMAR [LAUNCESTON].—The month began with much needed R and cloudy weather, but the middle and end were very hot and dry, with the wind blowing steadily from N. and N.W. A bright and dry month with very little T or heavy rain. The grass min. fell to 39°·0 on 22nd.

STROUD, UPFIELD.—Heavy storm, with T from 1.30 to 2.30 p.m., and with T and vivid L from 3.30 to 4.30 p.m. on 5th A man killed under a tree, two miles from here.

WOOLSTASTON.—A very hot month. The long drought broke up on the 2nd, but too late to save the hay crop, which is very scanty. T and L on 3rd. Mean temp. 61°·2.

TENBURY, ORLETON.—A very warm, dry month; the warmest June recorded here in 35 years, the mean temp. being more than 4°·5 above the average, and 0°·8 above that of June, 1868. The R of the first six months of the year is 7·21 in., or just one-half of the usual quantity, and less than in any other year since the record was started. T on the 3rd and 25th.

LEICESTER, BARKBY.—T and L on 6th and 7th, T on 2nd, 3rd, 4th, 15th, 16th, 17th, 24th and 30th.

HULL, PEARSON PARK.—TSS on 2nd, 4th, 6th, 8th and 20th. H on 6th.

SEATHWAITE.—Very hot on the 4th, with T and L and heavy R at 4 p.m. T and L from 10 a.m. to 5 p.m. on 6th.

WALES.

HAVERFORDWEST.—Although R was measured on 13 days, still the month must be reckoned as another of disastrous drought. The falls of R were so small (except on the 4th and 15th) and the sunshine and high temp. so much

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above the average for June, that they completely neutralized the rainfall. The total fall from the 1st January up to the end of this month, has only amounted to 9·40 in., beating the record of all former years since 1849. This is certainly one of the most unfortunate seasons on record in this county. The month ended with boisterous winds and lower temperature.

ABERYSTWITH, GOGERDDAN.—Bright sunshine throughout the month; wind mostly from S. and S.W.

SCOTLAND.

CARGEN [DUMFRIES].—The mean temp. of the month is 2°·7 above the average, and has only twice during the last 37 years been slightly exceeded, viz., in 1865 and 1893. This high mean temp. has been reached notwithstanding a spell of cool east winds during the first ten days of the month. The rainfall is unusually heavy for June, but the total for the first six months of the year is more than 3·50 in. below the average. T and L on 1st, 8th and 11th. With the exception of a W. breeze, very strong for this season, on 30th, and a fairly stiff blow from N.W. on 21st, winds have been unusually light. Crops generally look well, and are in a very advanced state.

JEDBURGH.—The temp. of the month has been much higher than in the June of 1895, and vegetation has progressed greatly. Flowers are fully a fortnight earlier this year. Tree and bush fruits are good crops, and grain crops look well, but there is now a want of rain, and pastures are getting bare in consequence.

COLMONELL.—Rainfall 1·60 in. above the average of 20 years. Mean temp. 60°·1, or 3°·4 above the average.

BRAEMAR.—A most excellent month; luxuriant growth, and roses in full bloom one month earlier than usual in this district.

ABERDEEN, CRANFORD.—Cold and wet with very little sunshine. Heavy thunder-shower on 19th, ·25 in. falling in 7 minutes.

S. RONALDSAY, ROEBERRY.—A wet month. Mean temp. 52°·4, slightly above the average.

IRELAND.

DARRYNANE ABBEY.—A very warm month.

O'BRIENSBRIDGE, ROSS.—June proved an average good month, with a lower temp. than May. The last day of the month was the coldest since March, with strong S.W. wind.

DUBLIN.—A very favourable, warm, summer-like month. It is true that the R and rainy days equalled, or slightly exceeded, the average but 78 per cent. of the total precipitation occurred on 3 days, leaving only 22 per cent. to be distributed over the remaining 11 rainy days. The month, therefore, was showery rather than wet. The heat on the 15th was very unusual for June in Ireland. The amount of cloud was large for so fine a month, and the strength and persistency of the N.W. winds of the closing period are noteworthy. Mean temp. 61°·4, or 3°·6 above the average. High winds on 7 days, but the force of a gale was attained only on the 30th. Temp. reached or exceeded 70° in the screen on 9 days. T8 and H on the 24th, and T on the 18th.

OMAGH, EDENFEL.—On the whole a very favourable month. The rainfall of the first week, followed by a brilliant spell of hot weather till the 15th, stimulated into further luxuriance the already fine promise of all vegetation; the rainy and broken weather of the latter half of the month, however, greatly added to the difficulty of saving the heaviest hay crop known for years.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXVII.] AUGUST, 1896. [PRICE FOURPENCE, or 5s. per ann. post free.

THE THAMES RUN DRY.

WHEN we look from London Bridge at the Thames, even at the very lowest tide, it is extremely hard to believe that less than two hundred years have passed since men walked across its bed, not indeed dry shod, but without serious inconvenience. We are not prepared to defend all that old chroniclers say, but on the other hand we are not inclined to regard all the following narratives as fictitious. Why should we?

The old London Bridges were almost like weirs, so greatly did they obstruct the flow of the river; but making full allowance both for that, and for slightly figurative language, the statements are very marvellous.

For suggesting the subject and for collecting some of the information, we are indebted to Mr. Henry Sharp, of Hampstead. We have added to it as much as time permitted, and if any of our readers can supplement or contradict it, we shall be obliged by their so doing, as of course our only desire is to ascertain facts.

A.D. 1114.—"This year there was so great an ebb everywhere in one day as no man remembered before. so that men went through the Thames, both riding and walking, east of [*i.e.* below] London Bridge.—*Anglo Saxon Chronicle*, Bohn's Edition, 1847, p. 484.

A.D. 1114.—April 4th. River Thames in London so dry that children waded over between the bridges, and the town. Under London Bridge only knee deep; was dry for two days.—*Stow.*

A.D. 1114.—October 10th. The Thames on that day suffered a great want of water; for between the bridge [*i.e.* London Bridge] and the royal Tower, and even under the bridge, the water of the river was so diminished, that not only horses, but also an innumerable crowd of men and boys walked through it, the water hardly reaching their knees. This shortness of water lasted from the middle of the preceding night till the full darkness of the following night.—*Florence of Worcester.*

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A.D. 1114.—Such a defect of water in the Thames that great numbers of people crossed not only above and below London Bridge, but likewise through several of its arches, upon the ground, with dry feet.—*Maitland's History of London.*

A.D. 1158.—An earthquake happened in many places through England, and the River of Thames was dryed uppe, that at London men might walke over the same dryshod.—*Stow's Annals*, 1615.

A.D. 1281.—So great a drought that men passed over the river Thames dryshod between Westminster and Lambeth, and over the Medway between Strood and Rochester.—*Stow.*

A.D. 1541.—A remarkable drought; almost all the small rivers dried up, and the river Trent diminished to a straggling brook. The river Thames so low that the sea water even at ebb, extended beyond London Bridge.—*E. J. Lowe's Natural Phenomena & Chronology of the Seasons*, 1870, p. 18.

A.D. 1591.—The Thames, historians say, was so dryed up, that a man might ride over it on horseback near London Bridge, —*Thoresby.*

A.D. 1592.—September 5th. One standing on the shore of the Thames could not see any water in it from London Bridge to Westminster.—*Stow* [See quotation in full under date of 1716, Sept. 14th.]

A.D. 1687.—May 12. This day there was such a storm of wind as had seldom happened, being a sort of hurricane. It kept the flood out of the Thames so that people went on foot over several places above bridge.—*Evelyn* in *Baker's Seasons.*

A.D. 1716.—September 14th. This being the last occasion, we have taken some pains to collect corroborative evidence as well as direct statements, and have quoted repetitions where any fresh fact is mentioned.

A.D. 1716.—DEAL.—September 14th. "Last night we had a violent storm at S.W., which drove several ships from their anchors."—*The Post Man*, No. 11520, September 15th to 18th, 1716.

DOVER.—September 14th. "Last night, in a dreadful storm, a Dutch ship was cast away"—*Idem.*

HARWICH.—"On Thursday night, September 13th, two laden ships from Newcastle were lost."—*Idem.*

YARMOUTH.—"Last night we had a violent storm, which drove from their anchors several vessels."—*Idem.*

LONDON.—"So violently tempestuous was this storm, that it obstructed the coming up of the tide in the River of Thames, which was even driven to so low an ebb, that both above and below the Bridge, people passed and repassed on the sands, which lay so clearly bare to view, that a silver tankard, a silver-hilted sword, a gold ring, a

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guinea, and several other things, were taken up, that had been lost there."—*The Weekly Packet*, No. 220, September 15th to September 22nd, 1716.

A.D. 1716.—September 14th. And in speaking of this, it ought to be taken notice that this river has several times been blown almost dry, so that one on the shore could not see any water in it from London Bridge to Westminster, particularly on the 5th of September, 1592, and again on the 14th of September, 1716; of the last I was an eye witness. The springs being then low, a strong Westerly wind that had blown all that day and the preceding night, prevented the tide coming in twenty-four hours, and drove forward the fresh water with that fury that there was only a narrow channel in the middle scarce ten yards wide, and so shallow that thousands of people passed over it on foot.—*Survey of London and Westminster*, by J. Stow, edited by J. Strype, 1754, Vol. 1, p. 58.

A.D. 1716.—[Date not given, context shows that it refers to 1716, 1717 or 1718, and therefore it doubtless was September 14th, 1716, *i.e.*, the same as the preceding.] By a long and dry season, the fresh stream of the river Thames was reduced so low, that by the intervention of a violent storm of wind at West South West, it was blown so dry, that many thousands of people passed it on foot, both above and below London Bridge, and through most of the arches.—*History of London, by W. Maitland, F.R.S.*, 1775, p. 521.

A.D. 1716.—September 14th. The Thames lay perfectly dry both above and below bridge, leaving only a very narrow channel; which extraordinary circumstance was occasioned by a strong westerly wind, that blew all the preceding day and night, which forced back the tide, and drove forward the ebbing waters.—*Boyle's Universal Chronology*, 1826, vol. ii., p. 748.

A.D. 1716.—"In the year 1716 a very remarkable phenomenon occurred at London Bridge, when in consequence of the long drought, the stream of the River Thames was reduced so low, and from the effect of a violent gale of wind at W.S.W. was blown so dry, that many thousands of people passed it on foot, both above and below the bridge, and through most of the arches. Strype, in his edition of Stow's *Survey*, Vol. 1, p. 58, states that he was an eye-witness to this event, and observes that, on September 14th, the channel in the middle of the river was scarcely ten yards wide, and very shallow, the violence of the wind having prevented the tide from coming up for the space of four and twenty hours. Whilst the Thames remained in this state, many interesting observations were made on the construction and foundation of London Bridge."—*Chronicles of London Bridge*, p. 482-3, by an Antiquary, London, 1827.

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THE FIRST USE OF KITES IN METEOROLOGY.

To the Editor of the Meteorological Magazine.

SIR,—In your review of the scientific use of kites at the Blue Hill Observatory (*Met. Mag.*, February, 1895, p. 10), you say:—"We believe that the first use of a kite in connection with meteorology was about 1750, when Franklin, in his well-known experiment, obtained electrical discharges from a thunder-cloud by means of a cord carried up to the cloud by a kite."

As the successful exploration of the lower mile of air by self-recording instruments, elevated by kites, at this Observatory is attracting world-wide attention, it seems but fair to state that kites were not first used for this purpose in 1752 by my illustrious countryman, Dr. Franklin, but, as far as I know, the credit belongs to a Scotchman, Dr. Alexander Wilson, Professor of Practical Astronomy at Glasgow, who in 1749, with a student, Thomas Melville, explored the temperature of the atmosphere in the higher regions by raising a number of paper kites one above another upon the same line, with thermometers appended to those that were to be most elevated. I quote an account of the experiment tried at Camlachie in July, 1749, from the biography of Alexander Wilson, M.D., contained in *Trans. Roy. Soc. Edin.*, Vol. x., Part II. :—

"Six paper kites, 4 to 7 feet in height, were made upon the strongest and lightest construction the materials would admit of. A quantity of line was spun of different sizes and strength. . . . The smallest kite, being exactly balanced, soon mounted steadily to its utmost limit, carrying up a line very slender, but of a strength sufficient to command it. In the meantime the second was made ready. Two assistants supported it between them in a sloping direction, with its breast to the wind, and with its tail laid out evenly on the ground behind, whilst a third person, holding part of its line tight in his hand, stood at a good distance directly in front. Things being so ordered, the extremity of the line belonging to the kite already in the air was hooked to the back of the second, which being now let go, mounted very superbly, and in a little time also took up as much line as could be supported to advantage, thereby allowing its companion to soar to an elevation proportionately higher. Upon launching these kites according to the method which had been projected, and affording them abundance of proper line, the uppermost one ascended to an amazing height, disappearing at times among the white summer clouds, whilst all the rest in a series, formed with it in the air below such a lofty scale, and that, too, affected by such regular and conspiring motions as at once changed a boyish pastime into a spectacle which interested every beholder. The pressure of the breeze upon so many surfaces communicating with one another, was found too powerful for a single person to withstand when contending with the undermost strong line, and it became necessary, therefore, to keep the mastery over the kites by other means.

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"This species of aërial machinery answering so well, Messrs. Melville and Wilson employed it several times during that and the following summer in pursuing those atmospherical experiments for which the kites had been originally intended. To obtain the information they wanted, they contrived that thermometers properly secured, and having bushy tassels of paper tied to them, should be let fall at stated periods from some of the higher kites, which was accomplished by the gradual singeing of a match-line. When engaged in these experiments, though now and then they communicated immediately with the clouds, yet as this happened always in fine dry weather, no symptoms whatever of an electrical nature came under their observation. The sublime analysis of the thunderbolt and of the electricity of the atmosphere, lay yet entirely undiscovered, and was reserved two years longer for the sagacity of the celebrated Dr. Franklin."

A. LAWRENCE ROTCH, F.R.Met Soc.,
Director Blue Hill Met. Observatory.

Readville, Mass., U.S.A., July 4, 1896.

REVIEWS.

*Neudrucke von schriften und Karten * * * herausg.* von Prof. Dr. HELLMANN. No. 5. Die Bauern-Praktik, 1508. Berlin: A. Asher and Co., 1896. 4to, 83 pages.

IT is unnecessary for us to say anything as to the excellence of this series of reprints. If in times to come meteorologists take any interest in the early history of their science, there will be no one to whom they will be so much indebted as to Dr. Hellmann. Who wrote this manual of weather proverbs is not known, but we believe that Dr. Hellmann is right in describing it as having the largest circulation of any meteorological book; sixty editions of it appeared in Germany, and it was translated and reprinted in France, England, Denmark, Norway, Sweden, Bohemia, Finland, &c. MS. copies have been traced back to the 10th century.

We are not going over the ground covered by Dr. Hellmann, but he has pointed out the difficulty of tracing in Germany the history of English editions of a popular book of this kind. He has done wonderfully well, but the hunt had a charm for us, and so, instead of reviewing Dr. Hellmann's book, we have done what we could towards giving a list of English editions. We are aware of many imperfections in it, but work of this class can be done by us only as a rest from matters of more practical importance, and our list must be accepted *quant. val.* Moreover, popular books like this, printed on poor paper, seldom provided with any better binding than a thick paper cover, were rarely preserved. As an illustration of the numbers which have perished, we may point out that the edition of

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1806? is stated on the second title page to be the 12th edition, and we cannot trace a single copy of any one of the previous eleven.

As might have been expected, both from the date, and from the class of printers by whom the books were issued, the printing and the spelling are very bad We have endeavoured to reproduce the titles verbatim, and have not specially marked the misprints; they are obvious.

THE BOOK OF KNOWLEDGE—THE HUSBANDMAN'S PRACTICE—THE SHEPHERD'S PROGNOSTICATION.

Before giving the list of editions, it may be well to explain that in its complete form the book consists of three parts, as above.

The first is attributed to Godfridus, an astronomer, of whom we can find no trace.*

The second is said to be based upon the works of Albert (*i.e.*, Albertus Magnus, 1193–1280), Alkind (*i.e.*, Alkindus, author of a treatise on rain, 1100?), Haly (*i.e.*, Albuassin or Alboazen Haly, an Arab Astrologer, 1255?), and Ptolomy (*i.e.*, Ptolemy the Astronomer, 120–161).

The third book is attributed to "Melampus, a Greek Author," of whom the only traces we have found are that Houzeau and Lancaster, in their *Bibliographie d'Astronomie* report, a MS. by Melampus = Melampous, entitled, "Methodus praedictionum lunarium," as existing in the Imperial Library at Vienna, and that Watt says that there was a Melampus or Melampodius, a physician, B.C. 270, but we are not aware of his having left any work on the weather, and certainly he in B.C. 270 could not have utilized the labours of Albertus Magnus and others who were not born until hundreds of years after he was buried.

1530? GODFRIDUS. Here begynneth THE BOKE OF KNOWLEDGE OF THYNGES VNKNOWEN APPERTEYNYNGE TO ASTRONOMYE, with certayne necessarye Rules, and certayne Sp[h]eres conteynyng herein. * * *

Compyled by GODFRIDUS *super Palladum de Agricultura Anglicatum.*

16mo—woodcut on back of title.

Impr. by me, Robert Wyer, dwellynge at the Sygne of S. John Euangelyst in S. Martyns Paryshe besyde Charynge Crosse.

British Museum Library.

(Lowndes reports two editions, one with cuts, the other without, but he gives no dates.)

* We think it just possible that the name Godfridus was placed upon the title page to give importance to the book. We see no reference to Godfridus in the lists for other countries, and have a suspicion that Godfridus was one Thomas Godfrey, a London printer, whose books are mostly without date, but a few are dated 1522 and 1532.

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[?] THE BOKE OF KNOWLEDGE OF THYNGES VNKNOWN, APPERTEYNING TO ASTRONOMYE, with certaine necessarye Rules. 16mo. London, Hugh Jackson.
Watt.

[?] THE HUSBANDMAN'S PRACTISE; or, PROGNOSTICATIONS FOR EVER, as teacheth Alberte, Alkin, Haly and Ptholome. 16mo. London, Hugh Jackson.
Watt.

1585. THE KNOWLEDGE OF THINGES VNKNOWNE, APPERTEYNING TO ASTRONOMY, wyth necessary Rules and certayne Sp[h]eares contayned in the same. Compyled by Godfridus *super palladium de agricultura Anglicatum.*

Imprinted at London, in Fleetestreete, beneath the Conduite, at the Signe of S. John Euangelist, by H. Jackson, 1585. 8vo.
British Museum Library.

1588. THE BOKE OF KNOWLEDGE. 8vo. London, Hugh Jackson.
Watt.

1642. **The husbandman's practice.**
Printed at London by A. N. for Iohn Stafford and are to be sold at his house in Black Horse [Alley in Fleet St.] Sm. 8vo.
Hazlitt.

1649. **The knowledge of things unknown, with the shepherd's perpetual prognostication.**
London: Printed by T. B. for John Stafford. 8vo.
Hazlitt.

1660. **The husbandman's practice.**
Printed for John Stafford and are to be sold at the sign of the George at Fleet Bridge. 8vo
Hazlitt.

1663. **The knowledge of things unknowne. shewing the effects of the planets and astronomical constellations,** with the strange events that befall Men borne under them, *front., woodcut on title, and several others.* **Black Letter.** 8°.

"Compiled by GODFRIDUS *super palladium de Agricultura, Anglicarum*:" this edition includes also the popular books—"The Husbandman's Practice, or Prognostication for ever," "The Shepheard's Prognostication and Wheel of Fortune."
Symons's Catalogue.

1664. THE HUSBANDMAN'S PRACTICE. 12mo.
Hazlitt.

1668. Title page missing, but [**The knowledge of things, &c.**]
8vo. Printed by G. P. for George Sawbridge, on Clearkenwell Green.
Hellmann's Library.

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1671. **Godfridus. The knowledge of things Unknown, with the husbandman's practice or prognostication for ever.**
12mo. Printed by G. P. for G. Sawbridge, on Ludgate Hill neer Fleet-bridge.
Symons's Catalogue.

1673. **The knowledge of things Unknowne,** &c., as in 1663. Two plates, 8vo.
Printed by W. T.[hackeray], and are to be sold by J. Hose over against Stapels Inn in Holborn.
British Museum Library.

1676. THE KNOWLEDGE OF THINGS UNKNOWN, shewing the Effects of the Planets, &c.
12mo. Printed for W. G. and are to be sold by J. Hose, over against Stapels Inn, in Holborn.
British Museum Library.

1679. THE KNOWLEDGE OF THINGS UNKNOWN, &C.
Lowndes.

1685. **The knowledge of things unknown.**
12mo. Printed for W. Thackeray at the Angel in Duck Lane.
Symons's Catalogue.

1688. **The knowledge of things unknown.**
8vo. Printed by J. M. for W. Thackeray at the Angel in Duck Lane.
British Museum Library.

1693. The Knowledge of things unknown . . . . with the Husbandman's practice.
8vo. Printed by W. D. for W. Thackeray at the Angel in Duck Lane.
Hazlitt.

1697. *The Knowledge of Things Unknown* : // Shewing the Effects of the *PLANETS* // and other Astronomical Constellations. // With the strange Events that befal Men, // Women, and Children, born under them. //

Compiled by Godfridus, *super palladium de Agricultura Angticorum.*

Together with * the Husbandman's Practice: or, // Prognostications for ever, as teacheth *Albert*, // *Alkind*, and *Ptolomy*. // With the Shepherd's Prognostication for the Wea- // ther, * and *Pythagoras* his Wheel of Fortune. //

This is unknown to many Men,
Though it be known to some Men.

Printed by *W. W.* for **W. Thackeray.**
No date, but from p. 136 it was [1697].

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Collation 8vo, Black Letter, pp. 1-76, then a second title as between the two * above, but adding "By *Melampus*, a Greek author," and at foot, "Printed by W. WILDE for H. RHODES in Fleet-street." This forms p. 77, and the book goes on to 172, after which follow 10 pp., unnumbered, giving dates of Fairs.

Symons's Library.

1707. *The Knowledge of Things Unknown.* Printed by H. RHODES at the *Star*, the corner of *Bride Lane*, in Fleet-street, 1707. Collation as above, but with a frontispiece of a man taking angular measurements of the stars (possibly missing from the 1697 copy).

Symons's Library.

1729. THE KNOWLEDGE OF THINGS UNKNOWN, shewing the Effects of the Planets and other Astronomical Constellations, with the Strange Events that befall Men, Women, and Children, born under them, together with the Husbandman's Practice and the Shepherd's Prognostication for the Weather, and Pythagoras, his Wheel of Fortune, *curious cuts*, 12mo. Printed for the booksellers of London and Westminster.

University of London Library.

1743. THE KNOWLEDGE OF THINGS UNKNOWN * * * * with the Husbandman's Practice.

London, Printed for J. Clarke, at the Golden Ball, in Duck Lane, and A. Wilde in Aldersgate Street.

British Museum Library.

1750. THE BOOK OF KNOWLEDGE; Treating of the Wisdom of the Ancients. 8vo. London.

Hellmann's Library.

1800? THE BOOK OF KNOWLEDGE. 12mo, Edinburgh.
This does not mention Godfridus, and contains only selections from the early editions.

British Museum Library.

[1806?] THE COMPLETE // BOOK OF KNOWLEDGE // (Treating of the Wisdom of the ANCIENTS): // shewing // the Effects of the PLANETS and other // Astronomical Constellations: * * * Likewise // a brief account of the natural causes of METEORS, // as Rain, Hail, Snow, Frost, Dew, &c. // * * *

London. Printed and sold by J. Hollis, No. 21, Shoemaker-row, Black-Friars. No date.

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Collation—8 vo. Frontispiece (a man looking through a very primitive telescope on an altazimuth stand) pp. 1 to 68, then ½-title, "The Husbandman's Practice; or, Prognostications for Ever," which occupies pp. 69 to 96. (It is very much abridged from the earlier editions). p. 96 finishes with "THE END," and the imprint of the above-named, J. Hollis.

In the same volume, by the same printer, and apparently of about the same date, is

THE SHEPHERD'S KALENDAR; or THE CITIZEN'S AND COUNTRYMAN'S COMPANION, containing . . . . Infallible signs of the weather, to know when wet or dry, when sudden storms arise, or hot or cold weather, by living creatures . . . . Being about Forty Years study and experience of a learned Shepherd. 12th Edition, with Additions.

8vo. London, J. Hollis, 21, Shoemaker's Row, Black-Friars.

Collation.—Frontispiece (a shepherd under a tree), pp. i. vi., 7-94. Pages 1-42 are almost wholly filled with weather proverbs, but are mostly different from those in the "Book of Knowledge," and they differ entirely from those in Claridge's "Shepherd of Banbury's Rules to judge of the Changes of the Weather."

Roy. Meteor. Soc. Library.

Three Essays on Australian Weather. HON. RALPH ABERCROMBY. F. W. White, Sydney, 1896. 8vo, iv.–101 pages, 4 plates.

ALTHOUGH not one of these three essays was written by Mr. Abercromby, his head and his purse have been largely instrumental in the production of the present handy volume.

The first is a reprint of Mr. H. C. Russell's paper on "Moving Anticyclones," read before the Roy. Meteor. Soc., and published in the *Quar. Jour.* in 1893.

The second is Mr. Hunt's "Essay on Southerly Bursters," which obtained the £25 prize offered by Mr. Abercromby, and which was mentioned on page 47 of our last volume.

The third essay is new; it has been prepared by Mr. Hunt at Mr. Abercromby's expense, and has been edited by Mr. H. C. Russell, the title being, "Types of Australian Weather." It may be briefly described as "40 weather maps of Australia, with commentaries thereupon." We have very little doubt that eventually that which we believe was at one time done in New Zealand will be done generally, viz., that instead of central offices telegraphing the actual readings at individual stations, they will send a code number

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corresponding to the type of pressure-system prevailing over their area. This series would form a good basis whereupon to develop such a system. The maps would have gained in clearness had the isobar for 30 inches always been made twice the thickness of any other. As it is, there are a few instances in which it is not easy to be sure what values some isobars represent—*e.g.*, the S.E. of No. 17 and the S.W. of No. 25.

There is one point upon which the author is silent, probably because he was writing as an Australian for Australians, and they doubtless realize the vastness of their country, and the immense areas whence they have no records, but for general readers it would have been well to give one map showing the stations whence alone data were available. If, as we presume, the arrows represent the stations, there seems to be an area (W. of Sir Charles Todd's line of telegraph stations) about twice the size of the British Isles, whence no returns are received; this gives a grand opportunity for drawing symmetrical isobars—and we see that they are drawn with equal confidence over the sea between Australia and New Zealand, a stretch of about 1,000 miles—say equal to the distance from Cornwall to Gibraltar; this again is a lovely field for the development of the imagination. We neither think nor suggest that Mr. Hunt's curves are improbable, but we should have had more confidence in them had the curves been solid where ample data existed, and dotted where they represent merely probabilities.

ERRATA IN "METEOROLOGICAL MAGAZINE," 1895.

Regular Tables.

Camden Square	Jan.	Min. temp. 20°·2 on 30th *should be* 17°·2 on 29th.
Cardiff, Ely	,,	Total rain *should be* 4·84 in., *not* 4·74 in.
,, ,, ...	June	,, ,, ,, ,, 1·24 ,, ,, 1·63 ,,
Glencarron Lodge	Oct.	,, ,, ,, ,,11·16 ,, ,,11·20 ,,
Darrynane Abbey	Sep.	,, ,, ,, ,, ·99 ,, ,, ·88 ,,

Supplementary Tables.

Dorking, Abinger Hall..	Jan.	Total rain *should be* 2·51 in., *not* 2·45 in.
Longford, Curry Grane ..	Feb.	,, ,, ,, ,, ·36 ,, ,, 2·07 ,,
Lynmouth, Glenthorne.	Mar.	,, ,, ,, ,, 3·94 ,, ,, 4·07 ,,
Clifton, Pembroke Road	,,	,, ,, ,, ,, 2·41 ,, ,, 2·27 ,,
Killarney, Woodlawn...	Oct.	,, ,, ,, ,, 4·63 ,, ,, 4·00 ,,

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 189[illegible]

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	56·4	28	23·2	26	46·2	34·7	36·6	88	86·9	19·8	·30	8	7·0
Malta	63·8	15*a*	40·1	18	60·2	51·3	46·8	84	119·1	33·2	1·91	9	6·3
Mauritius	85·6	8	69·6	25	82·3	73·8	70·8	81	135·8	62·4	30·06	22	7·1
Calcutta	98·5	27	52·4	21	86·3	61·6	54·3	54	149·7	44·0	·02	1	1·3
Bombay	85·5	29	65·4	21	82·4	69·0	65·5	70	133·5	52·4	·00	0	1·2
Ceylon, Colombo	93·4	27	67·5	2	89·8	72·4	68·5	71	160·5	60·0	·35	2	3·3
Melbourne	102·8	17	49·2	2	75·0	58·6	56·0	71	149·9	40·0	3·08	8	6·3
Adelaide	110·9	17	53·4	1, 3	86·2	63·7	52·3	45	160·8	42·7	·32	5	3·8
Sydney	98·0	1	58·7	4	76·9	66·8	65·0	77	156·4	51·3	4·74	18	6·9
Wellington	79·0	22	45·0	12*b*	69·6	54·9	50·1	65	139·0	36·0	3·34	6	3·7
Auckland	84·0	8	48·5	25	75·1	58·3	54·4	65	146·0	45·0	·34	6	4·0
Jamaica, Kingston	91·1	12	65·8	1	85·6	69·4	66·4	76	...	...	2·40	5	3·2
Trinidad	89·0	5dys	63·0	26	86·9	66·7	67·5	77	167·0	61·0	·88	7	...
Grenada	85·0	24	69 0	11	81·7	71·4	66·2	70	151·2	...	3·45	15	2·0
Toronto	44·9	28	—17·2	17	29·7	14·6	20·6	83	73·0	—23·5	3·95	...	6·8
New Brunswick, Fredericton	44·4	24	—20·0	18	25·8	7·3	13·3	76	...	...	4·78	14	5·8
Manitoba, Winnipeg	45·8	26	—42·4	15	18·5	—7·5	...	...	...	...	·42	5	3·9
British Columbia, Esquimalt	55·1	18	26·2	29	50·4	37·4	38·7	89	...	...	6·80	21	7·8

a—and 27. *b*—and 24.

REMARKS.

MALTA.—Adopted mean temp. 54°·1, or 0°·2 above the average. Mean hourly velocity of wind 9·5 miles. Thunderstorm on 24th; hail on 16th and 17th. Dew-point temp. ranged between 35°·3 on 17th and 56·9 on 24th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·7 below, of dew point 0°·8 above, and rainfall 22·91 in. above, their respective averages. Mean hourly velocity of wind 13·0 miles. or 1·7 mile above average; extremes, 51·3 on 19th, and 1·8 on 3rd; prevailing direction, E.S.E. Lightning on 2nd and 3rd, and thunder on 7th. This month has been the wettest on record all over the Island, and especially on the uplands, from 40 to 55 inches falling at several stations; from 9 a.m. on 19th to 10.25 a.m. on 20th 17·34 in. of rain fell at the Observatory. C. MELDRUM, F.R.S.

Adelaide.—Mean temp. 1°·3 above the average of 39 years; rainfall ·28 in. below the average. The absolute max. in shade is the highest ever recorded here in February. C. TODD, F.R.S.

Sydney.—Mean temp. 1°·0 above, humidity 2·9 above, and rainfall ·76 in. below, their respective averages. H. C RUSSELL, F.R.S.

Wellington.—Very heavy rain (2·10 in.) on 2nd, with a strong N.W. gale, then generally fine up to the 22nd; remainder of the month showery, especially on 23rd, when 1·00 in. of rain fell. Strong N.W. winds during the latter part, otherwise a fine, bright, warm month. Mean temp. 0°·2 below, and rainfall ·20 in. below the average. R. B. GORE.

Auckland.—An exceedingly dry and fine month, the rainfall being less than one-tenth of the average. Barometrical pressure and mean temp. both above the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—In Kingston, weather fair; mean hourly velocity of wind 4·6 miles; rainfall about four times the average. In the Island generally, however, the fall was twice the average. R. JOHNSTONE.

TRINIDAD.—Rainfall ·81 in. below the average of 30 years. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, JULY, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall .	1·39	XI.	Lake Vyrnwy	2·35
,,	Birchington, Thor	1·39	,,	Corwen, Rhug	1·60
,,	Hailsham	1·65	,,	Llanystumdwy, Talarvor	3·45
,,	Ryde, Thornbrough	1·03	,,	I. of Man, Douglas	5·93
,,	Emsworth, Redlands ...	1·15	XII.	Stoneykirk, Ardwell Ho.	6·51
,,	Alton, Ashdell	·92	,,	New Galloway, Glenlee	7·01
III.	Oxford, Magdalen Col..	1·39	,,	Lilliesleaf, Riddell	3·68
,,	Banbury, Bloxham	1·21	XIII.	N. Esk Res. [Penicuick]	4·05
,,	Northampton, Sedgebrook	1·23	,,	Edinburgh, Blacket Pl..	4·33
,,	Alconbury	1·08	XIV.	Glasgow, Queen's Park..	3·92
,,	Wisbech, Bank House...	1·58	XV.	Inverary, Newtown	4·05
IV.	Southend	1·12	,,	Oban, The Corran	...
,,	Harlow, Sheering..... ...	·83	,,	Islay, Gruinart Schools..	3·91
,,	Colchester, Lexden	·57	XVI.	Dollar.....	4·20
,,	Rendlesham Hall	·35	,,	Balquhidder, Stronvar...	4·62
,,	Rusball Vicarage	1·00	,,	Ballinluig	2·79
,,	Swaffham	2·07	,,	Dalnaspidal H.R.S.....	3·96
V.	Salisbury, Alderbury ...	·69	XVII.	Keith H.R.S.....	3·03
,,	Bishop's Cannings	1·71	,,	Forres H.R.S.	3·06
,,	Blandford, Whatcombe .	·86	XVIII.	Fearn, Lower Pitkerrie..	3·58
,,	Ashburton, Holne Vic...	2·29	,,	N. Uist, Loch Maddy ...	4·61
,,	Okehampton, Oaklands.	1·81	,,	Invergarry.....	2·24
,,	Hartland Abbey	1·61	,,	Aviemore H.R.S.	3·09
,,	Lynmouth, Glenthorne.	1·11	,,	Loch Ness, Drumnadrochit	2·09
,,	Probus, Lamellyn	2·13	XIX.	Inversbin	2·06
,,	Wellington, The Avenue	1·33	,,	Scourie	3·15
,,	Wincanton, Stowell Rec.	1·21	,,	Watten H.R.S.....	3·34
VI.	Clifton, Pembroke Road	·97	XX.	Dunmanway, Coolkelure	6·83
,,	Ross, The Graig	1·08	,,	Cork, Wellesley Terrace	5·16
,,	Wem, Clive Vicarage ...	2·34	,,	Killarney, Woodlawn ...	6·05
,,	Cheadle, The Heath Ho.	1·04	,,	Caher, Duneske	4·89
,,	Worcester, Diglis Lock	1·81	,,	Ballingarry, Hazelfort...	5·19
,,	Coventry, Coundon	2·09	,,	Limerick, Kilcornan ...	4·00
VII.	Ketton Hall [Stamford]	1·46	,,	Broadford, Hurdlestown	...
,,	Grantham, Stainby	1·86	,,	Miltown Malbay	5·55
,,	Horncastle, Bucknall ...	1·75	XXI.	Gorey, Courtown House	5·07
,,	Worksop, Hodsck Priory	1·53	,,	Athlone, Twyford	7·48
VIII.	Neston, Hinderton	1·98	,,	Mullingar, Belvedere ...	6·94
,,	Southport, Hesketh Park	3·98	,,	Longford, Currygrane...	7·41
,,	Broughton-in-Furness ...	5·66	XXII.	Woodlawn	7·24
IX.	Ripon, Mickley.....	1·84	,,	Crossmolina, Enniscoe ..	4·52
,,	Melmerby, Baldersby ...	2·17	,,	Collooney, Markree Obs.	4·69
,,	Scarborough, Obs.	2·02	,,	Ballinamore, Lawderdale	...
,,	Middleton, Mickleton ...	2·49	XXIII.	Lough Sheelin, Arley...	7·67
X.	Haltwhistle, Unthank...	3·08	,,	Warrenpoint.....	7·72
,,	Bamburgh	2·60	,,	Seaforde.....	6·78
,,	Keswick, The Bank.....	4·16	,,	Belfast, Springfield	7·74
XI.	Llanfrechfa Grange	1·66	,,	Bushmills, Dundarave..	5·64
,,	Llandovery	1·97	,,	Stewartstown	7·26
,,	Castle Malgwyn	4·33	,,	Killybegs	4·60
,,	Builth, Abergwesyn Vic.	3·29	,,	Lough Swilly, Carrablagh	4·01
,,	Rhayader, Nantgwillt ...	2·64			

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JULY, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	1·03	— 1·65	·49	26	7	88·7	14	47·7	2, 2
II.		Maidstone (Hunton Court)...	·73	— 1·45	·40	26	3	...	...	...	...
,,		Strathfieldsaye	·60	...	·25	26	7	...	...	...	...
III.		Hitchin	1·01	— 1·71	·56	26	9	85·0	13	44·0	10
,,		Winslow (Addington).....	1·02	— 2·27	·45	26	12	87·0	21	40·0	29
IV.		Bury St. Edmunds (Westley)	2·07	— ·50	·44	29	11	78·0	14*b*	47·0	18
,,		Norwich (Brundall).....	1·00	...	·23	15	8	85·0	21	41·4	3
V.		Weymouth(LangtonHerring)	·72	— 1·43	·22	24	10	75·0	10*c*	50·0	29
,,		Torquay (Cary Green)	1·52	...	·84	24	10	75·4	7	50·0	28*g*
,,		Polapit Tamar [Launceston]..	1·55	— 1·86	·63	24	13	80·7	20	39·4	28
VI.		Stroud (Upfield)	·68	— 2·89	·17	1	12	83·0	20	49·0	28
,,		ChurchStretton(Woolstaston)	2·28	— ·69	·65	9	12	81·5	20	45·0	17
,,		Tenbury (Orleton)	1·77	— 1·09	·52	31	12	85·3	13	38·9	28
VII.		Leicester (Barkby)	3·55	+ ·56	2·78	7	14	85·0	20*d*	38·0	27
,,		Boston	·73	— 2·06	·22	7	7	92·0	13	45·0	28
,,		Hesley Hall [Tickhill].....	1·61	— 1·06	1·02	26	11	86·0	20	42·0	28
VIII.		Manchester(PlymouthGrove)	1·90	— 1·89	·50	24	13	85·0	13	41·0	27
IX.		Wetherby (Ribston Hall) ..	1·90	— 1·28	·42	22	8	...	...	...	...
,,		Skipton (Arncliffe)	3·97	— 1·67	1·05	24	10	..	...	...	...
,,		Hull (Pearson Park).	1·18	— 1·41	·57	26	10	85·0	20	43·0	29
X.		Newcastle (Town Moor)	2·70	— ·82	·95	24	12	...	..	...	...
,,		Borrowdale (Seathwaite).....	8·97	— 2·02	1·53	8	18	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	1·64	— 2·42	·45	24	11	...	...	...	...
,,		Haverfordwest	4·60	+ ·39	1·32	24	15	76·8	20	40·6	28
,,		Aberystwith (Gogerddan) ...	2·88	...	·55	9	13	76·0	31	36·0	16
,,		Llandudno.....	2·97	— ·03	·92	9	14	73·0	20	48·5	8
XII.	SCOTLAND.	Cargen [Dumfries]	5·27	+ 1·34	1·13	23	12	74·2	13	39·0	28
,,		Jedburgh (Sunnyside).....	3·17	— ·27	·55	8	12	77·0	13	38·0	28
XIV.		Colmonell	7·09	...	1·67	8	20	79·0	12	40·0	9, 27
XV.		Lochgilphead (Kilmory)	4·21	— ·09	·48	19	23	...	...	38·0	27
,,		Mull (Quinish).....	4·43	+ ·38	·76	25	24	...	...	...	...
XVI.		Loch Leven Sluices	4·30	+ ·68	1·30	26	10	...	...	...	...
,,		Dundee (Eastern Necropolis)	3·75	+ ·29	1·35	25	15	76·8	18	42·2	28
XVII.		Braemar	3·23	+ ·02	1·06	25	15	74·4	18	35·0	24
,,		Aberdeen (Cranford)	3·54	...	1·32	25	18	78·0	19*e*	42·0	2, 27
XVIII		Strathconan [Beauly]	2·55	— ·95	1·25	27	10	...	...	...	...
,,		Glencarron Lodge.....	4·02	...	·90	25	20	69·0	13	39·6	28
,,		Cawdor	3·74	+ ·44	·84	25	21	...	...	...	...
XIX.		Dunrobin	3·31	+ ·46	1·39	24	15	70·0	19	44·0	25*h*
,,		S. Ronaldsay (Roeberry).....	3·11	+ ·75	1·20	25	14	67·0	11	45·0	1
XX.	IRELAND.	Darrynane Abbey.....	5·82	...	1·57	23	20	...	..	...	...
,,		Waterford (Brook Lodge) ...	7·06	+ 3·53	2·00	9	14	74·0	18	43·0	27
,,		O'Briensbridge (Ross)	5·50	...	2·23	24	16	..	...	...	...
XXI.		Carlow (Browne's Hill)	4·76	+ 1·24	1·67	8	16	...	..	...	...
,,		Dublin (FitzWilliam Square)	5·47	+ 2·79	2·02	24	18	76·7	13	45·0	28
XXII.		Ballinasloe	7·62	+ 4·07	2·50	24	19	72·0	20	40·0	10
,,		Clifden (Kylemore)	8·36	...	2·31	8	20	...	...	...	...
XXIII		Waringstown	8·10	+ 4·58	1·82	8	20	79·0	11	45·0	4
,,		Londonderry (Creggan Res.).	5·44	+ 1·32	1·31	25	25	...	...	...	...
,,		Omagh (Edenfel)	4·63	+ ·91	·90	8	20	70·0	13	37·0	27

+Shows that the fall was above the average ; —that it was below it.

a—and 14, 20. *b*—and 22. *c*—and 14. *d*—and 21. *e*—and 20. *f*—and 31. *g*—and 29.
h—and 28. *i*—and five other dates.

METEOROLOGICAL NOTES ON JULY, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

HITCHIN.—This month completes the driest period of seven months from January to July in our record, except 1870.

ADDINGTON.—A hot, dry month, what little rain fell being quickly dried up by the hot ground. On the evening of the 7th, at 6 o'clock, a heavy TS with constant and vivid L but little R occurred to the N. of us. At the end of the month R was much needed, the pastures being dried up and brown. Harvest operations general in the last week of the month.

BURY ST. EDMUNDS, WESTLEY.—A very hot month, with much sunshine, and the storms, as in June, were very partial. The scorching sunshine damaged the barley on light lands. Distant T on 7th, TS on 15th, and T on 26th.

NORWICH, BRUNDALL.—The warmest July since 1887, and the warmest month since August, 1893, the mean temp. being 62°·8. Rainfall 1·89 in. below the average, the deficiency of the year being 3·73 in. The surface of the soil was much scorched and parched by the sunshine and want of rain. The 21st was the warmest day since August 18th, 1893. T and L on 7th; distant TS on 8th.

WEYMOUTH, LANGTON HERRING.—Since the beginning of the year the rainfall has been only 7·63 in., the lowest for the first seven months of the year in 22 years, and only 52 per cent. of the average. Root crops in this neighbourhood are a total failure. The mean 9 a.m. temp., 63°·8, is exactly 1° above the average, and this is the ninth consecutive month with temperature above the average. Fog on the 6th; T and L on the 7th and 14th.

TORQUAY, CARY GREEN.—Rainfall 1·27 in. below the average; the fall of seven months, January to July, being 9·83 in. below the average. Mean temp. 62°·8, or 1°·6 above the average. Duration of sunshine 242 hours 40 mins., being 58 hours 20 mins. above the average; one sunless day.

POLAPIT TAMAR [LAUNCESTON].—Another very dry, hot month, the average max. shade temp. being 69°·5. Fogs early on 5th, 6th, 7th, 12th, 16th, 17th and 19th.

WOOLSTASTON.—Another hot month, and till the 21st very dry, though there was a heavy fall on the 9th. The want of water is severely felt, the brooks being nearly dried up. Harvest began very early, and the grain crops generally are good. Mean temp. 60°·9.

TENBURY, ORLETON.—Another very fine, warm month, with a mean temp. more than 2°·5 above the average. There was a large proportion of hot sun during the first half of the month, but more unsettled weather prevailed towards the end. T on 7th, 17th and 26th.

LEICESTER, BARKBY.—A heavy TS occurred on the 7th, the like of which has not been experienced for many years, 2·78 in. of R falling. This fall did not reach to the Leicester Reservoirs, a few miles hence, so that the water famine continues there in increasing intensity. Mean temp. 61°·8.

MANCHESTER, PLYMOUTH GROVE.—Very fine summer weather prevailed on the 12th and 13th, also on 19th and 20th; but on the whole the weather was dull, cold and unsettled. Mean temp. 57°·5, the lowest for July since observations commenced in 1868. T and L on the 9th.

WALES.

HAVERFORDWEST.—The temp. fell somewhat during the first few days, and small quantities of R fell up to the 9th; very fine harvest weather then prevailed with bright sunshine up to the 15th, when the temp. fell and the wind blew a

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moderate gale; fresh breezes prevailed for a couple of days, followed by fine warm weather again up to the 21st, when a rather sudden fall of temp. took place, with showers. R commenced falling at 5 p.m. on the 23rd, and in about 36 hours 2·80 in. fell, a most acceptable fall, as the country seemed on the verge of ruin. The weather was then fine to the end of the month. No excessive heat prevailed, but the temp. rose above 70° on 14 days. There was a sharp TS at 4 p.m. on the afternoon of the 31st. Prevailing winds N.E. and N.W.

SCOTLAND.

CARGEN [DUMFRIES].—Absence of sunshine (53 hours below the average of the month) and excessive rainfall were the features of the month. Out of a total rainfall of 5·27 in., 3·02 in. fell in the three days 23rd–25th, this heavy fall doing considerable damage to the heavier crops of corn. The mean bar. pressure and mean temp. of the month were about normal. Harvest, which commenced on several farms during the last few days of the month, will be one of the earliest on record in the district, and, generally speaking, crops are above the average. The turnip crop promises well; pastures continue excellent, and the hay crop was above an average. Potato disease made an unusually early appearance on some farms in the district.

JEDBURGH.—Vegetation made great progress during the month, and all crops look well. The harvest will be a fortnight earlier than usual. Potatoes a good crop, and quite free of disease.

COLMONELL.—Rainfall 3·63 in. above, or rather more than twice, the average of 20 years. Mean temp. 58°·9, or 0°·3 above the average.

ABERDEEN, CRANFORD.—There was little sunshine throughout the month, and a strong gale blew from the north on the 27th.

S. RONALDSAY, ROEBERRY.—A very fair month upon the whole, although wetter than the average of 29 years. Mean temp. 55°·0, 0°·5 above the average.

IRELAND.

DARRYNANE ABBEY.—A wet but warm month.

O'BRIENSBRIDGE, ROSS.—A very favourable month for all purposes, the rather heavy R having fallen in a limited number of days. The heavy fall of 24th (2·23 in.), owing to the dryness of the land and dykes, was quickly absorbed, and did little damage.

DUBLIN.—A generally favourable month, characterised, however, by occasional torrential rainfalls. Rainstorms of exceptional violence occurred on the 8th (1·56 in.) and 24th (2·02 in.) The fall of the 24th is the largest recorded since May 28th, 1892, when 2·06 in. fell. The mean temp., 60°·9, is slightly (0°·3) above average. High winds were noted on only 3 days, and attained the force of a gale only on the 4th. L on the 9th; TS on the afternoon of the 25th; solar halo on the 10th.

WARINGSTOWN.—The wettest month recorded since 1861, when the record began; but in spite of this the crops of all kinds look magnificent, and we only want a moderately fine six weeks to secure a splendid harvest.

OMAGH, EDENFEL.—The frequent and heavy rains which prevailed with but little intermission throughout the month, although of much benefit to grass and green crops, damaged the cereals and imperilled the safety and quality of the hay.

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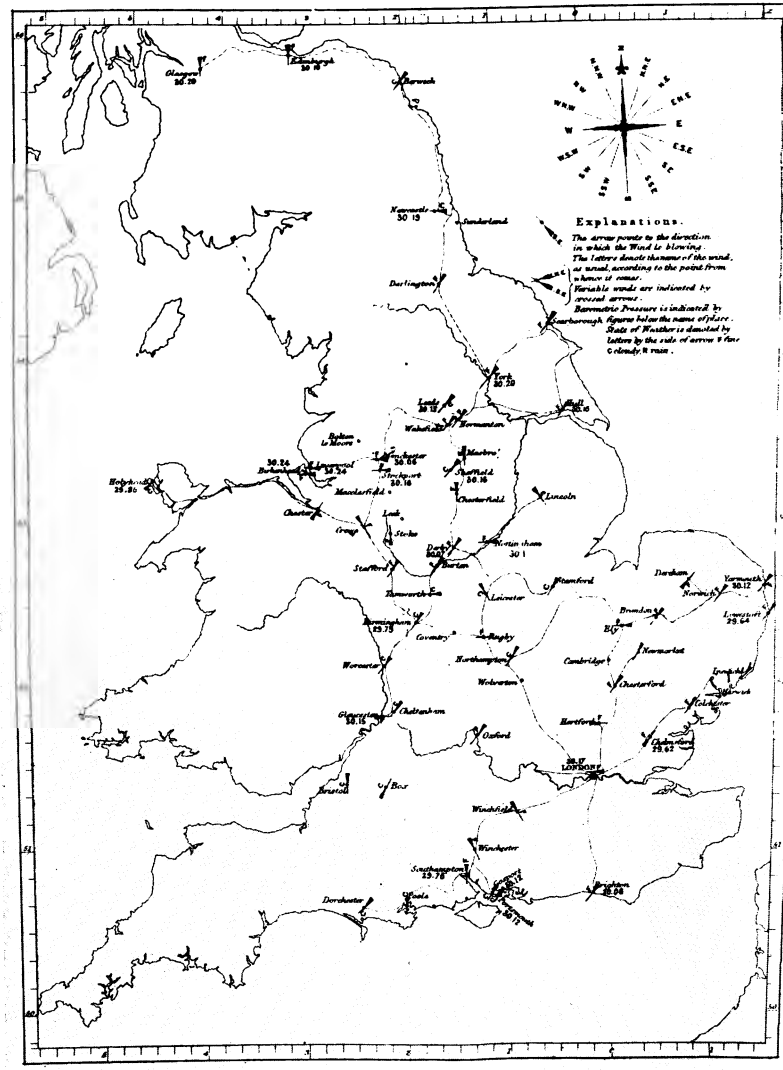
REGISTER MAP INDICATING CONDITIONS OF THE ATMOSPHERE ON THE SAME DAY IN SEVERAL PARTS OF GREAT BRITAIN FROM OBSERVATIONS COLLECTED AT THE GREAT EXHIBITION at 9 am. 8th Aug.t, 1851.



London_Trelawny Saunders, 6 Charing Cross.

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SYMONS'S

MONTHLY

METEOROLOGICAL MAGAZINE.

CCCLXVIII.] SEPTEMBER, 1896. [PRICE FOURPENCE, or 5s. per ann. post free.

THE FIRST DAILY WEATHER MAP, SOLD IN THE GREAT EXHIBITION OF 1851.

IT is not safe to claim priority for anything, especially while Dr. Hellmann is working in the same direction; but we have not much fear of the above heading being disproved. It will be noticed that we do not say "The First Weather Map," because maps representing atmospheric conditions on special days had been produced many years earlier; they were, however, records of the past, representations of the facts observed months or years before; whereas, by a Daily Weather Map is meant a map published the same day, and containing information transmitted by electric telegraph.

Admiral FitzRoy never published a Daily Weather Map, and his successors, the Meteorological Council, did not give us one until 1872. Le Verrier issued his first on Sept. 16th, 1863; and this, Prof. Harrington in his "History of the Weather Map" *(Chicago Congress)* considered to be the first.

We have the pleasure of presenting our readers with a reduced copy of the first of a series of such maps issued *twelve years earlier.*

We have not yet obtained all possible information respecting it, and, therefore, will now state only, that (1) the accompanying map is rather more than a quarter the size of the original, which is 10·2 in. by 7·2 in. (260 × 183 mm.); (2) that the daily issue continued from August 8th to October 11th, 1851, Sundays excepted; (3) that they were sold daily in the Great Exhibition; and (4) that the Royal Commissioners have kindly lent us the set whence the annexed reproduction has been made.

When we have concluded our enquiries, we hope to lay the results before our readers.

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THE BOOK OF KNOWLEDGE.—ISOBARS.—ESCHUID.

To the Editor of the Meteorological Magazine.

SIR,—Your supposition about Godfridus seems to me quite right. Melampus means Black Foot; the name of this old Greek author is placed upon the title page for the same reason as that of Godfridus, viz.: to give importance to the book. Another fictitious author figures on the title page of the edition of 1750 which I possess:

> "Written by *Erra Pater*, a Jew, Doctor in Astronomy and Physick, born in Bethany, near Mount Oliver, in Judea. Made English by W. Lilly, Student in Physick and Astrology." (1)

May I, at the same time, put two questions:—(A) Who was the first to draw (and publish) mean isobars of a country? Is there an earlier map of such isobars than that of France, by E. Renou? (*Annuaire Soc. Mét. de France* 1864). (B) Who first used the word *isobar*? Perhaps Mr. Babington, in FitzRoy's office? (2)

Can anyone tell me anything about the author of the large astro-meteorological work known under the abbreviated title *Summa Anglicana*, printed at Venice in 1489? The author is called *Eschuid*, but this is no English name. The work was written about 1347, by a Fellow of Merton College, Oxford, at the same time as, or a little later than, when another Fellow of the same College (Merle) kept the earliest journal of the weather. In manuscripts of the *Summa Anglicana*, which are numerous, the author's name is spelled

Joannes de Ashenton.
" " Ashedene.
" " Eschendenis.
" " Escheudn.
" " Aschelden.
" " Esschyngden, &c., &c. (3)

Yours very truly,

G. HELLMANN.

August 19th, 1896.

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(1) We do not quite understand Dr. Hellmann classing Erra Pater's book with Godfridus's, there seems to us so little in common—of Erra Pater there are in the British Museum editions of 1535, 1540? 1600? 1606, 1607? 1630? (two editions), 1700, 1746, 1780, and 1794.

(2) In Admiral FitzRoy's *Weather Book*, 1863, p. 106, he uses the word "isobarometric," whence isobar was a natural contraction.

(3) Dr. Hellmann may well put "&c., &c."; in *Houzeau* we find Aysheden, Aschyden, and Eshuid; *Gesner* gives Estuidius, and the *Crawford Catalogue* gives as the English equivalent, Eastwood. We have no authority for the suggestion, but think that it was probably a member of the old Lancashire family of Assheton.—ED.

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Mr. C. Leeson Prince has kindly lent us his copy of

> THE SHEPHERD'S KALENDER; or THE CITIZEN'S AND COUNTRY MAN'S DAILY COMPANION . . . . Infallible signs of the weather, to know when wet or dry, and when sudden storms arise . . . . being about Forty years study and experience of a Learned Shepherd. 5th Ed. London. Printed for C. Hitch at the Red Lyon in Paternoster Row; R. Ware, at the Sun and Bible on Ludgate Hill; and J. Hodges at the Looking-glass on London Bridge. *No date but probably* 1705. 12mo.

This book indicates on how large an enquiry anyone would enter who tried to follow the influence of *The Book of Knowledge*. Pages 15 to 43 (really 51, for the printer has made a mistake and used the numbers 41 to 47 twice) are crammed with weather proverbs, and it is certain that the writer had *The Book of Knowledge* before him, but the quotations are never verbatim, and usually each sentence taken from Godfridus is about half copy and half original. The preface is signed J. S., but we do not know who was the author—he however gives a remarkable collection of weather proverbs, and if Mr. Inwards or anyone else, instead of merely collecting proverbs, tries to trace them back to their origin, this work must not be overlooked. But what with *The Husbandman's Guide*, *The Shepherd of Banbury's Rules*, and *The Shepherd's Kalender*, and the uncertainty as to the date of the first issue of each, the task would not be easy.

We regret having passed an error on p. 104; the edition of 1676 (like most of those dated between 1673 and 1697) was printed for W. Thackeray; the entry W.G. should be W.T.

DRY PERIODS.

Under date of August 1st, Mr. G. J. Symons wrote to *The Times* pointing out that at Camden Square—

(1) The Rainfall of the first seven months of 1896 (8·27 in.) is only 60 per cent. of the average for the 37 years 1859-95.

(2) Out of the 38 years 1859-96, there are only eight in which the fall for the first seven months did not exceed 10 inches, only three of these cases occurring in the first 28 years of the period, while five cases occur in the last 10 years.

(3) The average for the first seven months during the 28 years 1859--86 is 14·24 in., while during the 10 years 1887-96 it is only 11·65 in.

(4) There has been no month since 1880 with a rainfall exceeding five inches, or with a fall of thrice the average.

Commenting on the above, Mr. James M. Fraser, of Lochmaddy, in the Hebrides, writes, "The average rainfall for the first eight

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months of the twelve years 1884–95, inclusive, is 27·78 in. This year the total for the first eight months is 34·86 in. Again, though the average for the first eight months, 1884–89, inclusive, is 25·46 in., the average for the first eight months, 1890–95, inclusive, is 30·11 in. These figures show that there is a heavy yearly increase in the rainfall in this district in the first eight months in each year. I mention this with special reference to your communication to the *Times*, about the beginning of August, on the increasing deficiency in the rainfall in the London district in the early months of the past number of years. My figures are from a table which I carefully prepared, and I only regret that my records do not go further back than 1884. It is strange that the London deficiency should be made up here—the opposite extreme of the kingdom."

This is not the first time that attention has been called to a deficiency in one part of the United Kingdom, extending over several years, being, in a sense, compensated by a similar excess in another district.

HEAVY RAINS AT THE BEGINNING OF SEPTEMBER, 1896.

Haslemere, Hazelhurst.—On September 2nd a sharp shower occurred at 2 p.m., and at 4.45 p.m. a sharp TS occurred, and a house in the town was struck by L, the curtains being set on fire. The R ceased at 5.45, and at 6 p.m. there was 1·03 in. in the gauge, most of which fell between 5 and 5.40 p.m. There was continuous R through the night, and the total to 10 a.m. on 3rd was 2·21 in.

T. P. NEWMAN.

Dorking, Fir Tor.—Between 1 p.m. on 1st and about 8 p.m. on 2nd, 3·40 in. of R fell. Of this, 2·75 in. fell in 20 hours between 1 p.m. on 1st and 9 a.m. on 2nd. The nearest approach to this fall was on July 14th to 16th, 1875, when 2·91 in. fell in 48 hours.

F. TAYLOR.

Reigate, Doods.—I found in the rain-gauge for the 24 hours ending 9 a.m., September 2nd, 2·27 in., which is the maximum fall since and including 1882. The R commenced at 11 a.m., slight at first, then a succession of heavy storms (accompanied by loud T and vivid L between 3 and 5 p.m.), continuing until the early morning.

G. E. PYM.

Upper Gatton.—I measured 1·88 in. of R as the fall for 24 hours ending 9 a.m. on 2nd. Most of this fell between 3.45 and 5.30 p.m., at 7.15 p.m., and at 9.30 p.m.; but the R was almost without intermission from noon to midnight.

F. DRUCE.

Sheppey, Leysdown.—Rainfall, September 1st to 7th :—

	1st. in.	2nd. in.	3rd. in.	4th. in.	5th. in.	6th. in.	7th. in.	Total. in.
London, *Standard* Office	·32	1·61	—	·23	·48	·08	—	2·72
Leysdown, Kent	·05	·01	—	·29	·01	·08	·03	·47

A. FARBROTHER.

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Milford-on-Sea.—On September 8th a fearful TS came on suddenly at 8 p.m., lasting till 11 p.m. L continuous and very brilliant, and very heavy H. R ·75 in. The storm was worst from 10 to 10.30 p.m., with probably more than ·50 in. in the half-hour.

A. F. PARBURY.

Bury St. Edmunds, Westley.—We had a tremendous rain on September 1st (2·10 in.), most of it fell between 5 and 6 in the evening.

R. BURRELL.

Wimborne, Chalbury.—Rainfall here, September 3rd, 1·11 in.; 4th, 1·84 in.; 5th, ·51 in. The 2·95 in. in two successive days is unprecedented.

G. H. BILLINGTON.

WHIRLWINDS.

BRIDGWATER, JUNE 9TH.

ON Tuesday afternoon (June 9th), at about 4.20 p.m., the neighbourhood of Bridgwater was visited by a small cyclone or whirlwind. This somewhat rare phenomenon must not be confounded with the ordinary cyclonic disturbance or "depression" which is the usual cause of the low barometer, rain and gales of the winter months, and which is generally of sufficient size to cover the whole of the British Isles. The true whirlwind or cyclone, of which we have recently received such terrible accounts from America, is of much smaller dimensions, often covering a track only a few yards wide, but where it passes it scatters wholesale destruction to trees and buildings, and when it passes over the sea it carries up the waves with it in the form of a waterspout.

The cause of this phenomenon is doubtless the electric tension existing between the clouds and earth, which, after long periods of dry weather often becomes very great, but usually passes off in the milder form of the thunderstorm. The typical or perfect whirlwind should show a revolving funnel of cloud, the broader end joining the clouds above, while the lower end comes down towards the ground, and, if near enough, it causes a corresponding whirling motion on the surface of the earth, carrying up such things as hay, or boughs of trees, and dust, and if of greater violence dealing out flashes and balls of lightning as it moves slowly along over the country.

From a report sent to the *Avalon Independent* it appears that at about 4 o'clock on June 9th a small whirlwind was formed near Glastonbury, which carried up 40 or 50 tiles from some cottages, and also conveyed a basket some distance through the air. It then seems to have gone up again to the clouds, but may have been the commencement of the one which visited Bridgwater a little later.

From what we can gather, the Bridgwater whirlwind was formed not far from Dunwear, or between that place and Chedzoy, in the form of a long "tail" of black vapour hanging from the clouds, that

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it then moved towards Chedzoy ((*i.e.*, was going N.), where it was met by an advancing storm cloud, into which it seemed to merge, and then to turn back again towards the south, and immediately to lower itself among the tree tops with a roaring noise. We have been told that two men were milking cows in a shed near Dunwear, and that the whole covering of the shed was removed, leaving only the skeleton, but we have not seen it. As the revolving wreaths of cloud drove through the trees, they fell before it in rows, until in a few moments about forty trees were uprooted or snapped off in a space of about a quarter of a mile square. The centre of the cyclone seems to have passed down a ditch, where it has levelled the rushes and grass as if a torrent of water had rushed down the "rhine."* Further on southwards is a small orchard, and here all the larger trees were torn to pieces, and then the wind passed along a lane, leaving very distinct traces in the hedge where the brambles and grasses were flattened and tumbled about in a very curious manner. At the end of this lane is a cottage facing south, and the wind coming up behind it (*i.e.*, going S.), or the sucking force exerted by the ascending whirl, blew out most of the windows into the garden, but fortunately did not unroof the house. From here the storm must have pretty nearly followed the course of the lane from East Bower to Dunwear (*i.e.*, going S.) as several trees are broken and uprooted as far as Mr. May's farm.

At the Bridgwater station the newspapers were scattered all over the platform, and the carriage works had a narrow escape from being unroofed, and some amount of damage was done. Passing over the low ground, the whirlwind next touched the trees round Mr. F. J. Thompson's grounds at Hamp, S.S.W. of Bridgwater, some apple trees were uprooted, and an elm was snapped off at some height from the ground, many smaller boughs were broken in the plantation near; and from an oak tree a large limb was wrenched off and flung over among the other boughs. The writer was at this moment, 4.25 p.m., standing at the end of Northfield (a street on the west side of Bridgwater), where the crashing of the falling trees could be distinctly heard, and the whirling clouds, and wind waving the distant trees had a very strange and awe-inspiring appearance.

In the lower part of Bridgwater the clouds seemed almost to touch the roofs, and the drifting masses of dark vapour were thought by many to be caused by a great fire near by. No doubt the phenomenon appeared under very different aspects at different stations, but from Northfield the sequence of events was in some such order as this:—At first a heavy thunderstorm passed from east to west, apparently between us and North Petherton, and in its rear another rapidly formed in the east and north-east. This then divided, part going towards the north, the other towards the south, while the whirlwind passed between them, the higher mountainous clouds

* Local name for a drainage stream on the level moors.

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moving very slowly, and towering high into the air, whilst below, torn shreds of vapour were being whirled from all points of the compass, the centre of the storm especially being most marked, the clouds seeming to be rolled up and drawn into the intensely black thundercloud in the south, while in a few moments it cleared as if by magic in the north and east, as the rushing wind swept over the neighbouring trees. Both sections of the storm then seemed to join again, apparently over Combwich, and loud peals of thunder and bursting reports like cannon came from the solid black mass which entirely hid the distant hills while torrents of rain fell over Cannington and neighbourhood. One of the strangest parts of the phenomenon was the unearthly humming sound, caused by the whirlwind after it had again risen into the thundercloud, and which was plainly audible from the low fields for a considerable time in the distance.

The rainfall here was under half-an-inch for the whole 24 hours, and none fell during the whirlwind or immediately after, and at present no accurate record has been sent us as to the amount which fell where the storm passed subsequently. H. C.

[The above appeared in the *Bridgwater Independent* of June 13th, 1896, but has been specially revised by the writer before publication in the *Met. Mag.*—ED.]

EASTBOURNE, AUGUST 4TH.

At about ten minutes to one yesterday afternoon (Aug. 4th) some excitement was caused on the sea front at Eastbourne by a whirlwind, which, though confined to a very limited area, caused damage to several boats. The first gust of wind nearly sank a sailing boat which was lying at anchor about 100 yards from the shore. The mizen sail was torn off. Three rowing boats belonging to Mr. Sayers, and lying near the groyne opposite the East Sussex Club, were blown into the air, and whirled along as if they were paper kites. They were carried towards the end of the groyne, opposite the Victoria-place steps. A lady sitting on this groyne had a narrow escape. Had she not been blown off before the boats reached the spot where she was sitting, she must have sustained serious injury. Two of the boats, the Wave Queen and the Dauntless, were so much damaged that they had to be at once removed from the beach for repairs. The timbers of the third boat, the Sunbeam, were broken in one part, or loosened, and some of the stanchions were forced out. About a dozen persons, adults and children, were thrown down by the force of the wind, among them being some men who ran after the boats when they saw them flying through the air. The hats of people on the beach were blown off, and newspapers and pieces of paper were carried to a great height. In addition to the boats mentioned, a rowing boat belonging to Joseph Mockett was turned upside down. According to an eye-witness, the whirlwind seemed confined to a space of only a few yards wide.—*Standard*, August 5th.

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REVIEWS.

Anales de la Oficina Meteorologica Argentina, por su Director G. G. DAVIS. Tomo ix. (2 parts) and x., 4to. Buenos Aires, 1893-6.

IT is impossible, in the space allotted, to do justice to these three portly volumes. We can only briefly indicate their contents. The first part of volume ix. is devoted to a brief description (unfortunately without a plan or a map) of Cordoba and its observatory, and to the printing in extenso of the majority of the observations taken there. It also contains the Director's report for the year 1889, with abstracts of the observations for that year at 16 stations, and the monthly rainfall at 27 stations on the Ferro-carril del Sud. We note that Dr. Davis has started an evaporation tank at Cordoba, somewhat smaller than, but much like those at Southampton and Camden Square, 3ft. 3in. × 3ft. 3in. instead of 6ft. × 6ft., but deeper, 2ft. 8in. instead of 2ft. The quantities in 1889 were—

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total.
Tank ...	(4·70)	2·66	3·74	2·85	1·88	1·81	2·77	3·18	3·88	5·54	5·57	5·31 ...	43·89
Copper..	5·97	3·37	4·80	3·51	3·07	2·93	3·88	6·33	8·17	9·82	7·85	8·13 ...	67·83
Ratio ...	1·27	1·27	1·28	1·23	1·63	1·62	1·40	1·99	2·10	1·78	1·41	1·53 ...	1·55

This series of observations promises important information. We find in another part of the volume the totals for four subsequent years, adding 1889 (for which we computed the value for January) we have—

1889.	1890.	1891.	1892.	1893.		Mean.
43·89	51·52	40·59	44·45	39·15	.....	43·92 in.

Further on we find that Dr. Davis has attached recording apparatus to the tank, which apparatus is so delicate that he has to apply a correction for the expansion of the water in the tank due to the diurnal range of temperature. We do not dispute the necessity for this, but we should have thought that, if that has to be allowed for, there should be another correction applied for the size of the tank, for certainly its sides are longest when the water is hottest; and, therefore, when the water swells with temperature the tank gets larger. We doubt whether this correction may not be a case of "straining at a gnat," &c.

The volume is most interesting; one could spend hours over it and its diagrams—some of the latter are original and good.

Volume x., besides the annual reports for 1890 and 1891, gives summaries of all the observations hitherto made at—

Salta	Lat.	24°	32′	S. ;	Lon.	66° 14′	W. of G.
Tucuman	,,	26	50	;	,,	66 12	,,
Carcarana	,,	39	49	;	,,	61 8	,,
Villa Maria	,,	32	25	;	,,	63 14	,,

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U.S. Department of Agriculture. Weather Bureau. Report of the Chief of the Weather Bureau, 1894. Government Printing Office, Washington, 1895 4to, 288 pages.

VERY similar to the volumes reviewed on p. 184 of our last volume, but noteworthy as being the first signed by the new chief, Prof. W. L. Moore.

It gives very little information respecting the operations of the office, possibly the details are given in some other document. We are glad to see a list of the publications up to date, such lists are always useful. Another new practice (we think adopted in the previous volumes of this series, but not mentioned in our review) which is very handy, is the binding of a leaf of strongly coloured paper between each section of the report, so that a glance at the edges shows where to turn to.

The tables of rainfall still give no information as to kind of rain gauge, or as to the height above the ground, or the altitude of the station. We do not understand why so very large a proportion of the stations are not complete for the year. We give the figures for the first six states :—

	Total Stations.	Perfect.	Imperfect. No.	Imperfect. Per cent.
Alabama	63	32	31	49
Alaska	5	2	3	60
Arizona.....	60	36	24	40
Arkansas	56	28	28	50
California.....	358	261	97	27
Colorado	98	48	50	51
Total.....	640	407	233	36

This shows that out of 1,000 stations, about 350 will be incomplete; more than ten times the proportion which are incomplete in this country. No matter how large be the total number of observers, there cannot be good work done as to secular variation, until this proportion of imperfect returns is reduced to a fifth, if not to a tenth, of what it was in 1894.

NEGATIVE RAYS AND THE AURORA.

A SERIES of experiments, relative to the action of a powerful magnetic field upon the negative rays in Crookes or Hittorf tubes, has been undertaken by Mr. Birkeland. These researches present some importance as regards the theory of the aurora borealis. M. Paulsen, the director of the Meteorological Institute of Copenhagen, claims that the aurora owes its origin to phosphorescence of the air produced in the upper regions of the atmosphere. Mr. Birkeland puts forth the idea that terrestrial magnetism may be the cause of such phosphorescence, which becomes intensified in the vicinity of the terrestrial poles.—*The Optician*, Aug. 20th.

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HEAVY MONSOON RAIN IN SOUTHERN INDIA.

[WE have been favoured with the following letter from the Ven. Archdeacon Wynne, and we have reprinted the second from the *Sheffield Daily Telegraph*, of August 27th, as the similarity of the reports is striking. Fifty-one inches in eight days is very heavy, but we think that it was probably far surpassed by Cherra Poonjee in July, 1861, when the total for the month was 366·14 in., and in 1865, when the July fall was 208·40 in. We find that in the (for that station) dry month of August, 1851, 55·11 in. fell in the eight days ending August 14th. The fall at Nagina, Bijnore (lat. 29° N., lon. 78° E.), in September, 1880, reached 32·4 in. on one day, and 8·6 in. on the next, or 41 inches in *two* days. This was the rain which produced the disastrous landslip at Naini Tal. These stations it is true are in Northern India, whereas the following letters are from the South; but the rainfall on the Ghauts has long been known to be very heavy, for example, at Mahabuleshwur, in July, 1840, the total was 134·42 in.; and falls exceeding 10 inches per diem are frequent in June, July and August.—ED.]

RAINFALL IN THE ANAMULLAI MOUNTAINS, SOUTH INDIA.

SIR,—The mean annual rainfall in this station (Sothapara) is 75 inches. The greatest for some years was 108 in. in 1882. This year the fall was excessive. A letter just received says that the precipitation for June, 1896, was 75·78 in., and for July, 95 in. The greatest fall occurred in the eight days beginning with July 23rd. The daily record was as follows:—July 23rd, 6·79 in.; 24th, 8·25 in.; 25th, 5·05 in.; 26th, 4·65 in.; 27th, 6·28 in.; 28th, 5·87 in.; 29th, 6·23 in.; 30th, 7·93 in., making a total for 8 days = 51·05 in. Is this not a record?

Yours faithfully,

G. R. WYNNE.

Woodlawn, Killarney.

RAINFALL IN INDIA.

SIR,—In view of our deficient rainfall in England, some of your readers may be interested in hearing how their countrymen, coffee planters in India, are faring. I have letters before me from two correspondents in Mysore, whose plantations border the Western Ghauts. The monsoon (periodic rain and wind storms) began about June 15th, and from that date to August 1st there had been "130 inches of rain, or 25 inches more than our average annual rainfall; and we are only half-way through the monsoon. During the last eight days we have had 45 inches."

Thus in eight days the rainfall was considerably greater in Mysore than ours in England for the whole year. It is reported as "by far

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the heaviest experienced during the last 25 years." At the same time "the wind has blown a hurricane for the last seven days, and we could hardly sleep, expecting each night that the roof would be blown off. Great damage has been done to the coffee estates; hundreds of shade trees torn up; numerous landslips, causing us the loss of about an acre of coffee trees here; roads washed away (on the hill sides); hardly a building but has suffered more or less."

So the lot of the British agriculturist abroad is not altogether a happy one, and by comparison the British climate after all is not one to grumble at. X.

August 25th, 1896.

WATERSPOUTS ON THE ATLANTIC.

One of the results of the remarkable weather which has prevailed across the Atlantic during the last two or three weeks has been the numerous waterspouts which have been observed by various vessels. One of these is described by Captain Friande, of the steamship Neustria, of the Faber line. A mass of dark clouds quickly gathered over the sky, and in a very little while the ship was in semi-darkness. The sea at the time was quite smooth, and the wind had fallen. Suddenly the most vivid lightning began to play incessantly, and the ship was encountering the most terrible electric storm ever experienced by the commander. Presently the lightning and thunder ceased, and as the ship emerged once more into the light, there was discerned about two miles away a rapidly moving waterspout whose base seemed about ninety feet thick, while its middle tapered to something like four feet in diameter, and its top was lost in the clouds. It approached within two hundred yards of the steamer, churning up the water as it moved, with a loud swishing sound. Many of the passengers were almost paralyzed with fear, expecting the column to overwhelm the ship, when suddenly it broke and came pouring down a little way astern, to be followed immediately by the growth of another one, which, however, did not approach the ship. In the same neighbourhood another ship, the London Hill, from Cochin, encountered another gigantic waterspout, which twisted and coiled and untwisted for some time, before it finally broke and fell into the water.

—*Daily News, August 31st*, 1896.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1896.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	65·2	22	29·4	15	53.3	39·9	41·0	83	103·2	24·9	3·20	25	7·3
Malta	68·7	29	46·2	13	63·6	54·1	50·1	82	132·3	40·0	1·03	8	6·3
Mauritius	84·4	3	68·6	15	82·1	72·1	68·9	79	134·8	61·4	3·51	15	5·8
Calcutta	101·2	28*a*	63·1	1	93·9	71·7	63·9	56	155·4	54·5	·15	1	1·9
Bombay	91·9	24	69·4	10	86·1	74·2	70·5	73	139·3	57·4	·00	0	0·9
Ceylon, Colombo	92·7	21	70·5	1	90·7	75·2	72·8	78	162·0	62·4	5·64	11	3·7
Melbourne	95·0	7	38·8	31	71·6	54·1	53·7	80	144·0	29·5	1·96	8	6·4
Adelaide	104·4	10	49·2	20	83·2	61·1	50·5	47	157·8	39·1	·43	3	5·2
Sydney	80·9	5	52·6	31	74·3	63·4	61·0	76	141·8	43·7	3·57	14	5·2
Wellington	75·0	24	42·0	13	65·9	55·3	52·2	74	134·0	35·0	8·29	17	5·0
Auckland	78·0	21	51·0	15	72·1	58·1	54·8	70	145·0	47·0	1·18	9	4·8
Jamaica, Kingston	89·3	29	65·1	5	85·8	69·0	66·0	74	...	...	·18	4	2·7
Trinidad	91·0	25*b*	61·0	15	87·7	68·8	69·6	76	174·0	60·0	1·59	11	...
Grenada	85·2	30	69·0	16	82·7	72·1	67·8	71	161·8	...	3·70	14	2·1
Toronto	53·1	29	4·8	13	31·0	15·6	19·0	76	70·2	—1·0	2·49	12	5·0
New Brunswick, Fredericton	54·8	26	—9·3	15	34·3	14·3	19·4	70	...	...	5·81	17	5·3
Manitoba, Winnipeg	48·9	27	—27·2	12	25·0	—0·2	...	...	...	...	1·85	14	4·7
British Columbia, Esquimalt	59·3	19	22·2	2	48·6	34·4	36·1	83	...	...	1·71	13	6·6

a—and 29. *b*—and 26.

REMARKS.

MALTA.—Adopted mean temp. 57°·0, or 1°·3 above the average. Mean hourly velocity of wind 12·1 miles. Average temp of sea 59°·0. Thunderstorm on 3rd; lightning on 30th. Dew-point ranged from 56°·3 to 42°·0. J. F. DOBSON,

Mauritius.—Mean temp. of air 1°·2 below, of dew point 0°·9 below, and rainfall 4·98 in. below, their respective averages. Mean hourly velocity of wind 10 miles, or equal to average; extremes, 23·2 on 8th, and 2·2 on 14th; prevailing direction, E.S.E. Lightning on 5th and 22nd; thunder on 28th and 29th. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on the 9th, 10th, 26th and 29th. Lightning was seen on the 11th, 23rd, 24th and 27th. D. G. MANTELL.

Adelaide.—Mean temp. 1°·7 above the average of 39 years. A very dry month; rainfall ·64 in. below the average. C. TODD, F.R.S.

Sydney.—Rainfall 1·87 in. below, temperature 0°·4 below and humidity 0·7 below, their respective averages. After very dry weather during the whole of 1895, and January, 1896, excessively heavy rains (in one case 12 inches in six hours) fell over a small area, and since that the drought has set in again. H. C. RUSSELL, F.R.S.

Wellington.—Generally fine up to the 13th, with occasional showers and fresh N.W. wind; from 12th to 20th showers and strong N.W. winds; from 23rd to 27th heavy rain, wind S.E. Thunder on 26th and 31st; fog on 26th, 27th and 31st. Altogether an unpleasant month. Rainfall 4·75 in. above, or more than double, the average. R. B. GORE.

Auckland.—An unusually fine and dry month, the rainfall being much less than one-half the average. Mean temp. considerably above the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—In Kingston, the weather was fair. Mean hourly velocity of wind 4·2 miles. Rainfall one-fourth of the average. R. JOHNSTONE.

TRINIDAD.—Rainfall ·28 in. below the 30 years average. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, AUGUST, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall.	2·51	XI.	Lake Vyrnwy	2·44
,,	Birchington, Thor	4·06	,,	Corwen, Rhug	1·92
,,	Hailsham	1·88	,,	Llanystumdwy, Talarvor	2·68
,,	Ryde, Thornbrough	2·21	,,	I. of Man, Douglas	2·25
,,	Emsworth, Redlands ...	2·03	XII.	Stoneykirk, Ardwell Ho.	1·92
,,	Alton, Ashdell	2·67	,,	New Galloway, Glenlee	2·32
III.	Oxford, Magdalen Col..	2·96	,,	Lilliesleaf, Riddell	1·72
,,	Banbury, Bloxham	1·72	XIII.	N. Esk Res. [Penicuick]	2·20
,,	Northampton, Sedgebrook	2·35	,,	Edinburgh, Blacket Pl..	1·79
,,	Alconbury	1·49	XIV.	Glasgow, Queen's Park..	1·64
,,	Wisbech, Bank House...	2·20	XV.	Inverary, Newtown	4·35
IV.	Southend	2·53	,,	Oban, The Corran	...
,,	Harlow, Sheering..... ...	4·16	,,	Islay, Gruinart Schools..	...
,,	Colchester, Lexden	3·26	XVI.	Dollar.....	1·96
,,	Rendlesham Hall	2·14	,,	Balquhidder, Stronvar...	3·49
,,	Rushall Vicarage	1·37	,,	Ballinluig	1·88
,,	Swaffham	1·98	,,	Dalnaspidal H.R.S.....	3·19
V.	Salisbury, Alderbury ...	2·09	XVII.	Keith H.R.S.....	3·61
,,	Bishop's Cannings	4·31	,,	Forres H.R.S.	1·96
,,	Blandford, Whatcombe.	1·67	XVIII.	Fearn, Lower Pitkerrie..	1·72
,,	Ashburton, Holne Vic...	2·00	,,	N. Uist, Loch Maddy ...	4·88
,,	Okehampton, Oaklands.	2·49	,,	Invergarry	3·45
,,	Hartland Abbey	1·98	,,	Aviemore H.R.S.	1·95
,,	Lynmouth, Glenthorne.	1·40	,,	Loch Ness, Drumnadrochit	1·78
,,	Probus, Lamellyn	1·87	XIX.	Invershin	2·98
,,	Wellington, The Avenue	1·95	,,	Scourie	7·40
,,	Wincanton, Stowell Rec.	2·03	,,	Watten H.R.S.....	1·92
VI.	Clifton, Pembroke Road	2·15	XX.	Dunmanway, Coolkelure	2·46
,,	Ross, The Graig	1·05	,,	Cork, Wellesley Terrace	1·19
,,	Wem, Clive Vicarage ...	1·56	,,	Killarney, Woodlawn ...	3·83
,,	Cheadle, The Heath Ho.	2·58	,,	Caher, Duneske	1·98
,,	Worcester, Diglis Lock	1·38	,,	Ballingarry, Hazelfort...	1·75
,,	Coventry, Coundon	2·29	,,	Limerick, Kilcornan ...	2·38
VII.	Ketton Hall [Stamford]	1·47	,,	Broadford, Hurdlestown	2·28
,,	Grantham, Stainby	1·93	,,	Miltown Malbay	4·20
,,	Horncastle, Bucknall ...	1·32	XXI.	Gorey, Courtown House	·81
,,	Worksop, Hodsck Priory	1·67	,,	Athlone, Twyford	2·66
VIII.	Neston, Hinderton	3·26	,,	Mullingar, Belvedere ...	2·06
,,	Southport, Hesketh Park	2·38	,,	Longford, Curragrane...	2·88
,,	Broughton-in-Furness...	4·78	XXII.	Woodlawn	2·71
IX.	Ripon, Mickley.....	2·48	,,	Crossmolina, Enniscoe..	4·05
,,	Melmerby, Baldersby ...	1·87	,,	Collooney, Markree Obs.	4·02
,,	Scarborough, Obs.	2·69	,,	Ballinamore, Lawderdale	2 29
,,	Middleton, Mickleton ...	2·05	XXIII.	Lough Sheelin, Arley...	2·64
X.	Haltwhistle, Unthank...	2·31	,,	Warrenpoint.....	1·40
,,	Bamburgh	2·10	,,	Seaforde..	1·60
,,	Keswick, The Bank	3·25	,,	Belfast, Springfield	2·73
XI.	Llanfrechfa Grange	1·81	,,	Bushmills, Dundarave..	3·07
,,	Llandovery	4·53	,,	Stewartstown	2·19
,,	Castle Malgwyn	3·40	,,	Killybegs	4·27
,,	Builth, Abergwesyn Vic.	4·66	,,	Lough Swilly, Carrablagh	4·22
,,	Rhayader, Nantgwillt...	4·11			

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AUGUST, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERA Max. Deg.	Date	I
			inches.	inches.	in.					
I.	ENGLAND.	London (Camden Square) ...	1·92	+ ·04	·37	24	14	77·1	13	4
II.		Maidstone (Hunton Court)...	2·82	+ 1·13	·90	9	10	...	...	
,,		Strathfieldsaye	2·37	...	·68	19	15	...	...	
III.		Hitchin	2·38	+ ·56	·49	31	15	73·0	13	4
,,		Winslow (Addington)	2·90	+ ·93	·54	30	14	77·0	13	4
IV.		Bury St. Edmunds (Westley)	3·07	+ ·87	·64	27	15	72·0	13	4
,,		Norwich (Brundall)	1·64	...	·32	21	17	73·2	13	4
V.		Weymouth(LangtonHerring)	1·04	— ·89	·29	30	10	73·0	12*b*	4
,,		Torquay (Cary Green)	1·03	...	·20	30	11	76·4	23	4
,,		Polapit Tamar [Launceston]..	2·40	— ·08	·71	25	14	74·8	2	4
VI.		Stroud (Upfield)	2·13	+ ·04	·65	30	15	76·0	23	4
,,		ChurchStretton(Woolstaston)	1·34	— 1·42	·20	18*e*	18	70·5	11	4
,,		Tenbury (Orleton)	1·90	— ·22	·67	1	16	74·5	13	4
VII.		Leicester (Barkby)	2·99	+ ·55	·70	30	17	75·0	13	3
,,		Boston	1·65	— ·47	·31	19	15	75·0	13	4
,,		Hesley Hall [Tickhill].....	1·63	— ·53	·55	8	7	70·0	11*c*	4
VIII.		Manchester(PlymouthGrove)	2·69	— ·40	·85	23	19	73·0	17	3
IX.		Wetherby (Ribston Hall) ..	2·35	+ ·01	·69	31	10	...	...	..
,,		Skipton (Arncliffe)	2·72	— 1·61	1·13	23	15	..	...	..
,,		Hull (Pearson Park).	2·78	+ ·14	1·17	26	15	72·0	12*d*	41
X.		Newcastle (Town Moor)	2·00	— ·71	·43	14	17	...	...	..
,,		Borrowdale (Seathwaite).....	8·73	+ ·28	1·95	23	21	...	...	..
XI.	WALES.	Cardiff (Ely).....	3·00	— ·61	·87	19	15	...	...	..
,,		Haverfordwest	2·39	— ·79	·52	18	15	72·3	1	42
,,		Aberystwith (Gogerddan) ...	4·46	...	1·18	18	19	73·0	1	..
,,		Llandudno.....	2·81	+ ·45	·85	31	18	68·0	12	49
XII.	SCOTLAND.	Cargen [Dumfries]	1·86	— 1·13	·52	29	10	71·8	11	40
,,		Jedburgh (Sunnyside).....	·85	— 1·39	·20	18*g*	9	74·0	11	39
XIV.		Colmonell	3·03	...	·62	12	13	71·0	1,12	39
XV.		Lochgilphead (Kilmory).....	3·83	— ·73	·55	17	17	...	...	40
,,		Mull (Quinish).....	6·36	+ 2·21	1·43	28	19	...	...	...
XVI.		Loch Leven Sluices	3·00	+ ·06	·90	24	12	...	...	...
,,		Dundee (Eastern Necropolis)	1·85	— ·72	·55	23	18	73·0	11	40
XVII.		Braemar	1·63	— 1·70	·24	12*a*	21	69·8	11	32
,,		Aberdeen (Cranford)	2·41	...	·50	14	20	68·0	11	35
XVIII		Strathconan [Beauly]	3·15	— ·15	·50	31	14	...	...	...
,,		Glencarron Lodge.....	6·79	...	2·49	28	25	65·2	31	39
,,		Cawdor	2·09	— ·16	·40	7	18	...	...	...
XIX.		Dunrobin	...	...	...	..	...	...	..	...
,,		S. Ronaldsay (Roeberry).....	2·82	+ ·26	·68	28	21	63·0	18	43
XX.	IRELAND.	Darrynane Abbey.....	2·82	...	·84	17	17	...	...	...
,,		Waterford (Brook Lodge) ...	1·17	— 2·25	·27	26	12	74·0	12*d*	42
,,		O'Briensbridge (Ross)	2·93	...	·62	26	13	...	...	...
XXI.		Carlow (Browne's Hill)	1·35	— 1·62	·27	25	12	...	...	...
,,		Dublin (FitzWilliam Square)	1·14	— 1·38	·17	17	18	71·1	23	45·6
XXII.		Ballinasloe	2·30	— ·88	·66	23	16	71·0	1	42·0
,,		Clifden (Kylemore)	7·03	...	1·45	29	19	...	...	...
XXIII		Waringstown	2·57	— ·54	·70	18	15	75·0	1	37·0
,,		Londonderry (Creggan Res.).	3·73	— ·39	·76	25	20	...	...	...
,,		Omagh (Edenfel)	2·49	— 1·00	·48	23	21	66·0	1	35·0

+Shows that the fall was above the average ; —that it was below it.

a—and 14. *b*—and 24. *c*—and 12, 13. *d*—and 13. *e*—and 26. *f*—and 25, 27. *g*

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METEOROLOGICAL NOTES ON AUGUST, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

ADDINGTON.—With one exception, the largest August rainfall since 1881, the exception being 1891, which gave nearly five inches. During the TS on the 26th a good deal of H fell in the neighbourhood, followed by a cold night.

BURY ST. EDMUNDS, WESTLEY.—The month was favourable for harvest work till the 18th; after that time much the reverse, the barley then cut is much grown and discoloured. About 5.30 p.m., on August 28th, a remarkably bright zenithal halo was seen for about ten minutes. The colours were quite as bright as any rainbow. Distant T on 8th and 26th; TS on 19th.

NORWICH, BRUNDALL.—The coolest August since 1888, and the driest since 1885; but few really warm summer days, and a great prevalence of cloud at times. L on 7th, 19th and 25th, and much T with L on the afternoon and evening of the 26th.

WEYMOUTH, LANGTON HERRING.—Mean temp. at 9 a.m. 60°·9, 1°·1 below the average. T on 8th; T and L on 26th. The total R for the first eight months of this year is 8·67 in., or only 52 per cent. of the average. The previous smallest rainfall for the first 8 months of the year was 11·24 in. in 1887. Smallest rainfall for consecutive days—

	in.		in.
Jan. 8 to Aug. 25, 1887, 230 days,	7·56	Dec. 31, 1895, to Aug. 16, 1896, 230 days,	7·73
„ 7 „ „ „ „ 231 „	7·92	„ 30, „ „ „ „ 231 „	7·73
		„ „ „ „ „ 31, „ 246 „	8·73
		Jan. 4, 1887 „ Sept. 6, 1887, 246 „	11·20

The drought of this year has been longer and more severe than that of 1887.

TORQUAY, CARY GREEN.—Rainfall 1·81 in. below the average; the fall of eight months, January to August, being 11·64 in. below the average. Mean temp. 61°·0, or 0°·4 below the average. Duration of sunshine 209 hours 25 mins., being 21 hours 45 minutes above the average. One sunless day.

POLAPIT TAMAR [LAUNCESTON].—The first three weeks were very dry, but during the last week 1·75 in. fell. The rainfall to the end of the month from January 1st is 7·77 in. below the average. Fogs on the 1st, 2nd, 11th, and 13th. Heavy TS at 2.45 p.m. on 1st; distant T on 2nd; heavy T and vivid L with R at 5.45 p.m. of the 8th.

STROUD, UPFIELD.—T on the 1st, 8th, 23rd and 26th; T and L on 25th.

WOOLSTASTON.—The dry weather continued till the 17th, after which R fell lightly almost every day. The harvest was secured in good condition by the end of the third week. Mean temp. 57°·3.

LEICESTER, BARKBY.—Rainfall gradually creeping up, total for year so far 13·75 in. Mean temp. for the month, 57°·4. L on 19th; T on 21st, 25th and 26th.

BOSTON.—The harvest was one of the earliest on record, new wheat being first shown in Boston market on the 5th, or 18 days earlier than the average of the previous 30 years; the yield and quality are both good.

MANCHESTER, PLYMOUTH GROVE.—No summer weather prevailed during the month, but upon the whole it was dull, cold and unsettled. Mean temp. 57°·5, the lowest for August since observations commenced in 1868, with one exception, namely August, 1885, which was the same.

HULL, PEARSON PARK.—TS on 19th, TS with H and R on the 26th.

WALES.

HAVERFORDWEST.—The temp. of this month was much lower than July; no extreme heat prevailed, and only on four days did the temp. exceed 70°,

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but the nights, with one or two exceptions, were rather above the mean. Although the rainfall was small, yet the continual drippings from the 17th to the end of the month, in conjunction with the temperate heat and the bright sunshine, went a great way towards neutralizing the effect of the long drought. Grass lands recovered wonderfully, and root crops (probably resown in many places) promise to be good. Prevailing winds W.N.W. and N.W. TS on 1st. Aurora on 15th, 16th, and 27th. Fog on 23rd.

ABERYSTWITH, GOGERDDAN.—Very showery throughout the month.

SCOTLAND.

CARGEN [DUMFRIES].—The mean temp. of the month is 1°·5 below the average, and has only in seven, out of 37 years been lower. Rainfall is the lightest registered in any year since 1884, and has only four times been less since observations commenced in 1860. With the exception of ·12 in. registered on the 12th, the wet weather occurred entirely in the latter half of the month. The heavy R during the night of the 29th was coincident with a sudden rise of temp., and was accompanied by a severe gale from S.W. Easterly winds prevailed for 15 days, distant T was heard on 26th. Almost all the corn in the immediate district was in the stackyards by the 22nd, about four weeks sooner than last year. The turnip crop promises to be one of the best on record, and pastures have seldom been more luxuriant at this season, fears are, however, entertained respecting the potatoe crop, owing to the prevalence of "disease." Distant T on 26th.

JEDBURGH.—The weather was characterised by great dryness for August, with a good deal of sunshine. The result was that vegetation made great progress. The cereal crops were begun to be cut in the first week, and in the early districts the most of it has been stacked in the finest order, a very unusual thing in August. Potatoes and turnips promise well.

COLMONELL.—Rainfall 1·02 in. below the average of 20 years. Mean temp. 1°·1 below the average.

ABERDEEN, CRANFORD.—The month was cold, with little sunshine.

S. RONALDSAY, ROEBERRY.—A sunless damp month. Mean temp. 53°·1, or 0°·9 below the average of six years.

IRELAND.

DARRYNANE ABBEY.—A dry month. The first half fine and warm, the second rather cold. Strong northerly gale on 26th.

O'BRIENSBRIDGE, ROSS.—A splendid harvest month up to the 17th, but the latter part changeable, with strong gales, veering from S.W. to N.W. The nights cold.

DUBLIN.—A cool, breezy, showery month, with a remarkable prevalence of N. and N.W. winds. The amount of cloud was very large in the mornings, but the evening skies were much freer from cloud. Mean temp. 58°·3, or 1°·4 below the average. The rainfall was much below, while the rainy days were considerably in excess of, the average. High winds were noted on as many as 13 days, and attained the force of a gale on three occasions, 13th, 24th, and 30th. T occurred on the 26th. Lunar halos were seen on the 19th, 24th, and 27th. Temp. reached 70° in the screen on 2 days. H fell on the 26th.

WARINGSTOWN.—The first half of the month was very dry and hot, the second half wet and blustery.

OMAGH, EDENFEL.—The first half of the month was very fine, although cool and with occasional light showers, but from the 17th to the end there was constant cool, rainy, and sunless weather, delaying and interfering with what had promised to be an early and abundant harvest.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXIX.] OCTOBER, 1896. [PRICE FOURPENCE, or 5s. per ann. post free.

THE RAINFALL OF SEPTEMBER, 1896.

SEPTEMBER, 1896, has been so exceptionally wet that we should scarcely be justified in passing it over without special treatment. Moreover, its wetness has been accentuated by the fact that it has followed (I.) an exceptionally long dry period, and (II.) a long series of years without an excessively wet month, so that the short-memoried public has had time to forget what a wet autumn month is like.

We give, in addition to our usual tables of rainfall, a table showing the September total at about 100 stations, for which the average 1880-89 is available, the excess of the month's fall over that average and in a third column the fall expressed as a percentage of the average, which shows at a glance where the total was two-and-a half times, twice, or one-and-a-half times, the average.

Plotting on a map the percentages from this table, as well as similar percentages calculated for the 50 stations printed in the regular table, we see that over a large area in the South of England, extending from Kent to Somerset, about two-and-a-half times the normal amount of rain fell, while over almost the whole of the United Kingdom south of latitude 52°, the stations recorded more than twice the average, the exceptions being Cornwall and mid-Gloucester. Durham and Northumberland show a fall only slightly in excess; Newcastle Town Moor record being even less than the average. In the Fen country, also, the fall was not exceptional, but over the whole of the remainder of England may be said to be 50 per cent. or more in excess.

Over Scotland, generally, the rainfall may be taken as one-and-a-half times the average, but shading off to 125 per cent. in the west, and increasing to 175 per cent. north of latitude 57°.

In Ireland the month was decidedly wetter than in Scotland, having more than twice the average fall over nearly all the southern half of the country, 250 per cent. being exceeded at one or two stations. Towards the north the fall diminished, decreasing to about 125 per cent. in the extreme N.E.

It may be interesting to state that in the tables there is not one entry three times the average, and only one entry of a minus difference.

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Rainfall of September, 1896.

Division.	STATION.	Total Rain.	Excess over Aver. 1880-89	Per cent. of Average.	Division.	STATION.	Total Rain.	Excess over Aver. 1880-89	Per cent. of Aver.
		in.	in.				in.	in.	
I.	Muswell Hill	6·26	3·59	234	VIII.	Neston (Hinderton)	3·45	·62	123
II.	Abinger Hall	8·00	4·85	254	„	Southport (Hesketh Park)	4·43	1·28	141
„	Guildford, Wern Stoke	6·09	3·33	221	IX.	Ripon (High Bank, Mickley)	3·98	1·39	154
„	Sevenoaks (Riverhead Vic.)	5·48	2·59	190	„	East Layton	4·07	1·55	162
„	Steyning	8·10	4·76	243	„	Mickleton	3·44	·43	114
„	Hailsham	6·14	3·22	210	„	„ (Lime Kiln Pasture)	3·65	·57	118
„	Alton (Ashdell)	8·24	5·05	258	X.	Haltwhistle (Unthank Hall	4·58	1·16	134
„	Newbury (Welford Park)	6·04	3·40	229	„	Keswick (Bank)	7·81	2·30	142
III.	Kensworth [Dunstable]	6·19	3·39	221	„	„ (Derwent Island)	8·07	3·25	167
„	Slough (Upton Hall)	5·58	3·11	226	„	Grasmere (High Close)	11·10	4·20	161
„	Oxford (Mag. Coll. Laby.)	4·83	2·39	198	XI.	Llanfrechfa Grange	8·16	4·57	227
„	Banbury (Bloxham Grove)	4·85	2·17	181	„	Llandovery	8·08	4·02	199
„	Castle Ashby	6·00	3·43	233	„	Castle Malgwyn [Llechryd]	5·93	2·10	155
„	Pitsford (Sedgebrook)	4·74	2·14	182	„	Rhayader (Nantgwillt)	11·30	6·52	236
„	Wisbeach (Bank House)	3·93	1·00	134	„	Corwen (Rhug Gardens)	5·53	2·83	205
IV.	Harlow (Sheering)	6·19	3·65	244	„	Llanystumdwy (Talarvor)	5·79	2·30	166
„	Saffron Walden (Newport)	6·05	3·75	263	„	Douglas (Victoria Road)	5·59	1·42	134
„	Ipswich (Bishop's Hill)	4·97	2·33	188	XIII.	N. Esk Reserv. [Penicuick]	4·75	1·14	132
„	Rendlesham Hall	3·83	·87	129	„	Leith	3·25	1·27	164
„	Harleston (Rushall Vic.)	5·42	2·51	186	XIV.	Ardrossan	3·93	·88	129
„	Swaffham	5·34	2·34	178	„	Glasgow (Queen's Park)	4·71	1·72	158
V.	Salisbury (Alderbury)	6·21	3·67	245	XVI.	Dollar	5·19	1·90	158
„	Bishop's Cannings	5·90	2·96	201	„	Balquhidder (Stronvar)	7·90	2·56	148
„	Marlborough (Mildenhall)	6·59	3·94	249	„	Dunkeld (Inverbraan)	5·03	1·99	165
„	Swindon, New	5·26	2·89	222	„	Dalnaspidal, H.R.S.	8·19	3·43	172
„	Blandford (Whatcombe)	8·54	5·28	262	XVII.	Keith, H.R.S.	4·75	2·04	175
„	Ashburton (Holne Vic.)	9·33	4·56	196	„	Forres, H.R.S.	3·83	1·46	162
„	„ (Druid Ho.)	8·82	4·91	226	XVIII.	Fearn (Lower Pitkerrie)	3·83	1·95	204
„	Okehampton (Oaklands)	7·70	3·83	199	„	Loch Shiel (Glenaladale)	..	..	..
„	Barnstaple Athenæum	5·68	2·19	163	„	Aviemore, H.R.S.	4·38	1·98	182
„	Lynmouth (Glenthorne)	6·82	3·47	204	XIX.	Invershin	4·82	1·78	159
„	Probus (Lamellyn)	4·61	·94	126	„	Golspie, H.R.S.	4·34	1·86	175
VI.	Clifton (Pembroke Road)	7·35	4·33	243	„	Scourie	6·40	3·01	189
„	Lechlade	5·67	3·24	233	„	Watten, H.R.S.	4·09	1·61	165
„	Great Barrington	5·71	2·73	192	XX.	Pallaskenry (Kilcornan)	5·97	3·76	270
„	Cheltenham (Southam Vil.)	4·67	2·05	178	„	Miltown Malbay	6·02	2·04	151
„	Tewkesbury (Upper Lode)	5·49	3·11	231	XXI.	Gorey (Courtown House)	5·54	2·62	190
„	Ross (The Graig)	5·93	3·43	237	„	Parsonstown (Birr Castle)	5·62	3·19	231
„	Cheadle (The Heath Ho.)	5·03	1·99	165	„	Athlone (Twyford)	5·53	2·28	170
„	Worcester (Diglis Lock)	3·66	1·22	150	„	Mullingar (Belvedere)	5·95	3·05	205
„	„ (Bevere Lock)	3·57	1·22	152	XXII.	Crossmolina (Enniscoe)	6·36	1·89	142
„	Droitwich (Holt Lock)	4·66	2·35	202	XXIII.	Warrenpoint (Summer Hill)	5·09	1·89	159
„	Stourport (Lincombe Lock)	6·01	3·55	244	„	Seaforde	4·57	1·27	138
„	Coventry (Coundon)	4·75	2·01	173	„	Donaghadee	3·93	·79	125
VII.	Ketton Hall [Stamford]	3·75	1·06	139	„	Bushmills (Dundarave)	4·99	·97	124
„	Horncastle (Bucknall)	3·42	·85	133	„	Stewartstown (The Square)	5·33	1·79	151
„	Worksop (Hodsock Priory)	4·26	2·21	208	„	Buncrana (Rockfort)	5·76	1·97	152

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The following additional records exceeding seven inches at stations in southern England are sufficiently remarkable to be worth quoting, though of course many larger totals could be given for stations in wet districts.

Middlesex	Hampstead, Branch Hill.....	7·38 in.
Surrey	Reigate, Woodhatch Lodge ...	8·09 ,,
	Wallington	7·20 ,,
Kent	Keston Tower	7·81 ,,
Sussex	Steyning	8·10 ,,
Hants	Ryde, Town Hall	7·80 ,,
	Botley, Curdridge	8·18 ,,
	Liss, Lingwood	9·11 ,,
Bucks	Great Marlow	7·11 ,,

That the great rainfall of the month was due more to persistent rain than to any one excessive fall is clearly shown by the following list, which includes all records received, of more than 2·00 in. in the rainfall day.

	in.			in.	
Haslemere, (Hazelhurst)	2·21	*1st.	Seathwaite	2·53	17th.
Dorking (Fir Tor)	2·75	1st.	,,	2·11	22nd.
Reigate (Doods)	2·27	1st.	Borrowdale Vic., Rosthwaite	2·13	16th.
Keston Tower	2·62	1st.	Buttermere (Hassness)	2·33	17th.
Bury S. Edmunds (Westley)	2·10	1st.	Borrowdale Grange	2·40	17th.
Poole (Parkstone)	2·12	8th.	Builth (Abergwessin Vic.)	2·03	22nd.
Ashburton (Holne Vic)	2·08	21st.	Rhiwbryfdir-Oakley Quar.	2·70	23rd.
Liskeard (Wadeland Ter.)	2·02	21st.			

We conclude with extracts from reports with which we have been favoured by correspondents.

Maida Vale. September rainfall 4·72 in., or nearly half-an-inch more than the total for the first five months of the year.

K. J. MARKS.

Dorking, Fir Tor.—The total R for September is 9·73 in. This is far beyond any other month in 23 years, as much as 7·50 in. never having been gauged. F. TAYLOR.

Reigate, Doods.—I registered 8·73 in. of R on 22 days in September, being the maximum in any month during 14 years. The nearest approach to this was 7·00 in. in October, 1891. G. E. PYM.

Tenterden.—The wettest September for 30 years, R 5·69 in.; in September, 1866, 5·56 in. fell. R for the nine months of 1896 only 1·80 in. below average, but ponds are still low and some wells empty. J. E. MACE.

Tunbridge Wells, Camden Park.—September R 6·71 in. on 25 days, the average for the month being 2·38 in., and the greatest fall previously 4·84 in., in 1885. For the first nine months of the year the total is 19·30 in., the average being 19·35 in. J. WESTON.

* This fall was incorrectly printed as occurring on 2nd in last month's *Mag.*

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Chichester, Forest Side Vicarage.—September R 9·57 in. on 25 days, being 7·61 in. more than the average of the previous seven Septembers.

Crowborough, Observatory.—The past month having been the wettest September in 55 years (1842-96), I send the amount for Uckfield, 7·16 in., and Crowborough, 8·01 in. The next wettest September at Crowborough was in 1876, 5·59 in. The wettest Septembers in the Uckfield register were 1852, 6·54 in., and 1866, 6·12 in. Notwithstanding the above heavy fall the total of the 9 months of this year is 3·37 in. below the average. C. LEESON PRINCE.

Long Wittenham.—The wettest September registered in 46 years. September, 1866, 5·60 in.; September, 1876, 5·57 in.; September, 1896, 5·98 in. F. C. CLUTTERBUCK.

Broxbourne.—The wettest month (R 6·17 in.) since July, 1880, when more than seven inches fell. G. J. NEWBERY.

Castle Ashby.—The heaviest September rainfall (6·00 in.) since the record commenced in 1873, the nearest being 5·65 in. in 1876. The only months exceeding six inches are July, 1880, 7·36 in., and October, 1891, 6·33 in. R. G. SCRIVEN.

Ipswich, Clare Lodge.—Rainfall for September, 6·04 in., five times the average of the previous six Septembers, and exceeding every other month but October, 1892, when 6·64 in. fell. On 1st, 2·35 in. fell between 9 a.m. and 3 p.m. E. R. TURNER.

Poole, Parkstone.—Rainfall, September, 1896, 9·23 in., max. fall 2·12 in. on 8th. Average for 14 years, 2·21 in., greatest previous fall, 4·77 in., in September, 1883. Total fall January 1st to September, 30th, 20·16 in.; average for 14 years, 19·41 in. Greatest monthly fall, 1882-95, 8·80 in., in October, 1891. R. H. BARNES.

Clifton, Pembroke Road.—The wettest September (R 7·35 in.) in 40 years, with the exception of 1874 (7·40 in.) and 1868 (7·68 in.). Rainfall considerably more than the total for the preceding five months. R. F. STURGE.

Ross, The Graig.—The following have been the wet Septembers since 1818, in Herefordshire:—

1839	5·57 in.	1866	5·91 in.	1869	5·85 in.
1841	5·80 ,,	1871	6·62 ,,	1876	6·86 ,,
				1896	5·93 ,,

In 1871 and 1876, September, with a greater depth of R than in 1896, had much fewer rainy days. H. SOUTHALL.

Rotherby Hall.—R fell on every day in September, making the total 3·45 in. J. HAMES.

Neston, Hinderton.—September, 1896, is the only month with 27 rainy days since observations commenced in 1868. R. BUSHELL.

Bolton, The Park.—Total R 9·14 in.; 5·34 in. above the average, and 3·95 in. more than that of any September in the preceding 11 years. W. W. MIDGLEY.

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Aysgarth Vicarage.—We had 6·02 in. of R in September, the average for 20 years being 3·00 in. This makes 25·89 in. for nine months, as against an average of 26·87 in. F. W. STOW.

Cork, Wellesley Terrace.—Rainfall more than double the average, and the greatest in September for at least 45 years. W. MILLER.

Broadford, Hurdlestown.—R more than double the average of 11 years, and the greatest on record for September. H. A. BENTLEY.

REVIEW

Report of the Director . . . . Liverpool Observatory, Bidston, 1895. Published by order of the Mersey Docks and Harbour Board. The Liverpool Printing . . Company, 1896. 8vo., 48 pages.

WE have had to abridge the title, otherwise it would have occupied many lines—perhaps the hint may be taken next year—it is enough to send a cataloguer into a fit.

Mr. Plummer is evidently bringing Bidston into good order, and his reports are both interesting and useful. While we are very thankful for what he gives us, we have a few suggestions to give him in return. We think that the latitude, longitude, and altitude of an observatory should always be given. It is rather amusing that he gives barometer readings uncorrected for altitude, and yet nowhere tells us what the altitude is, although he gives a table of corrections whence it could be computed.

In the tables of daily results there are a few facts which might be made clearer. "Mean temperature" is determined in many ways; at Bidston it is $\frac{M+m}{2}$ and this might with advantage be put at the top of the column. "Mean temp. of Evaporation" and "Amount of Cloud"; there is nothing to show whether these values are the means of several observations, or the values for 9 a.m. only. "Amount of rain" a — or ... is much clearer than 0·000; by the former one sees the rainy part of a month at once, with the 0·000 one has to look carefully; for the same reason we prefer ·412 to 0·412, because then, falls exceeding an inch are noticed at once.

The Appendix on Gales of Wind is interesting, but it would have been improved by an engraving of the Observatory, and a reproduction of part of the Ordnance Map shaded to show the configuration of the ground (*c. f.* Mr. Curtis's paper on the Holyhead anemometers). We are very glad that Mr. Plummer has given us the catalogue of wonderful pressures at Bidston, and we hope that before long, either by the erection of a Dines's tube anemometer, or in some other way, these records will either be substantiated or corrected.

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SEVERE SNOWSTORM IN MELBOURNE, JUNE 22ND, 1896.

Australia is about as far S. of the equator as Arabia is N. of it. Snowstorms are not frequent in the Red Sea. The *Melbourne Argus* might, therefore, well use the strong word "unprecedented" at the beginning of the following note.

MELBOURNE, JUNE 23RD.

An unprecedented event in the history of the Telegraph branch, occurred yesterday, June 22nd, when telegraphic communication by every route from Melbourne to Sydney was completely interrupted through a heavy snowstorm which occurred over a wide area beyond Yass during the early hours of the morning, and brought all the lines down. There are nine different circuits between Melbourne and Sydney, besides some connections from Adelaide, and yesterday morning it was found that the whole of them had been interrupted. Though breakages on one or more of the lines between the Victorian and New South Wales capitals have frequently occurred in the past, such a thing as a general stoppage of telegraphic communication has never been known before. When the exact position of matters was ascertained the public were notified that any messages lodged would be liable to delay, consequently fewer telegrams were received than usual, and it is hoped that business may be dealt with by making use of the trains to and from Sydney, which will carry the telegrams over the break which has occurred. Gangs of linemen have been despatched from Sydney to effect the necessary repairs.

SYDNEY, JUNE 23RD.

Last night provided the coldest weather of the year in Sydney, and exceptionally low temperatures prevailed in other parts of the colony. The thermometer registered in the city at daybreak 42·5 deg., and rose only a few degrees during the whole day. Heavy falls of snow occurred over all the central high lands, the drifts being of sufficient depth at Lawson to stop the passage of the train for over an hour, until the line could be cleared by gangs of workmen. The weight of the snow on the trees broke down several strong saplings.

Dubbo, Cootamundra, Murrumburrah, and stations as far north as Walcha all reported snow as falling.

The weight of the snow broke down last night long lengths of telegraph lines between Picton and Wagga, and was responsible for a complete stoppage of telegraphic communication with Victoria, South Australia, and Tasmania, as well as with all stations south of Picton.

The mountain ranges presented a beautiful spectacle to-day, the heights being hidden in a glistening white mantle of snow. The weather in the country is said to have been the most severe experienced for 20 years.

The tempestuous weather continued to-day (23rd) over the whole of the high lands and coastal districts. Falls of snow are reported from many country districts where snowstorms were previously unknown. Heavy seas are raging along the coast, compelling many vessels to seek shelter. The rainfall for the past two days in Sydney is over three inches, and that for the month is almost the heaviest on record.

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THE FROST OF FEBRUARY, 1895.

WE do not profess to remember all the meteorological literature even of one year, but the impression at present occupying our mind is that the exceptional frost of 1895 has not received the study and attention it deserves. It seems to us that the Central Bureaux and the Societies which have numerous stations reporting to them are mostly overworked, so that the respective staffs have as much as they can do to bring out (often terribly after date) vast masses of mean values (which are seldom utilized), and, therefore, that when exceptional phenomena occur no one has time to work up the details, and so the lessons of the event pass unutilized. We have just received a copy of Mr. Mossman's paper,* with its beautiful maps, and we have been trying to see which of the great Government offices or which of the Societies has brought out anything analogous.

We began with the most ably conducted meteorological journal, the *Zeitschrift*, but we have found only a page and a half, and of it only part original, part taken from the *Met. Mag.*, part from a note read by M. Renou at the Paris Academy (which we have not seen). The *Quar. Jour. of the R. Met. Soc.* gives a paper by Messrs. Bayard and Marriott, excellent, if we must not say perfect, as regards England and Wales, and good as regards the whole British Isles, but without a line as to what had occurred on the Continent. In the *Annuaire Soc. Met. de France* Dr. Giraux gives a short note on the frost in the Department of la Marne. In *Ciel et Terre* we have (*a*) a great development of the *Revue Climatologique* usually given by M. Lancaster, and (*b*) a paper by M. Marchal on *Les grands froids observés en Belgique*—a useful historical memoir. Our readers will find several articles upon the frost and its effects in the last volume of the *Met. Mag.*

Mr. Mossman is, therefore, as far as we can trace, the only writer who, besides reporting fully what occurred in his own country, has made the faintest attempt to show why that frost occurred, and what were the leading features of the distribution of pressure over Europe which caused it.

We feel quite sure that it is a mistake to have so many stations that publication of the records falls behind (we have just received one volume referring to 1893!), and that, when an exceptional phenomenon occurs, there are no assistants who can be set to work upon it. We hope that someone will take up the subject, not from a local standpoint, but from a European or a cosmical one; and if we are to wait until the annual volumes are all out in 1898 or 1899, better so than not at all. But why are meteorological publications so behind? Surely because the Directors have too many stations.

Mr. Mossman's paper is very interesting. He shows that, as regards mean temperature, out of 132 years only 5 Januaries were

* *The Frost of* 1895 *in Scotland.* By R. C. MOSSMAN, F.R.S.E., Excerpt *Jour. Scot. Met. Soc.*

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colder, and only one (1855) February. For the two months the mean for 1895 (30°·1) was not merely 1°·1 below any previous year, but actually the coldest two months for 132 years. The author gives full details of the frost in Scotland, and of the distribution of its intensity, which is elucidated by a map; but meteorologists who wish to know not merely facts but also causes, will be still more attracted by the charming map of the mean pressure over Europe during the week when the frost was most severe. Mr. Mossman has based this upon the data in the *Bulletin International*, and it shows very plainly the existence of a large high pressure area (about 30·5 in.) at the top of the Gulf of Bothnia.

It will, perhaps, be remembered that the subject of earth temperatures and burst waterpipes was fully discussed in these pages. Mr. Mossman gives much additional information. It was much colder in Scotland than in England, yet there are only two stations which report temperatures at 22 inches deep below 32°, and they were Arbroath, 31°·5, and Poltalloch, 31°. At 2 ft. it would, of course, have been a shade warmer. This may surely be regarded as confirmatory of our statement (*Met. Mag.*, 1895, p. 55).

"Looking back over all the thermometric records, we adhere to our original opinion that at no spot in England did the natural soil in its normal condition become frozen at the depth of 2 ft."

Why water-pipes at that and greater depths burst to such an extent as to cost £50,000 or £100,000 to repair is indicated in the above article, and that argument has not, that we are aware, been controverted.

A LUNAR RAINBOW.

To the Editor of the Meteorological Magazine.

SIR,—While standing on the highest point of the cliffs at Trimingham, in Norfolk, on September 16th, at 8.30 p.m., I observed the somewhat rare phenomenon of a lunar rainbow. Starting from the Cromer, or N.W. direction, and arching over the edge of the cliff towards the little village of Mundesley, the arc lengthened gradually for four or five minutes, until it was a complete bow, both ends reaching the horizon; it remained complete for a minute or two, and then gradually faded out, the northerly end disappearing first. The bow was quite colourless, looking only a milky white upon a fine grey mist lying over the sea. It was, however, quite clearly defined, and appeared to be of the width and radius of an ordinary solar bow. The moon was at an altitude of about 22°, and during the greater part of the time partially covered with a small cloud. The cliffs at Trimingham are 300ft. above the level of the sea.

Yours truly,

E. WHITE WALLIS.

76, *Carlton Hill, N.W., October 8th*, 1896.

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WHIRLWINDS, CYCLONES AND TORNADOES.

To the Editor of the Meteorological Magazine.

SIR,—The terminology in the extract on "Whirlwinds," from the *Bridgwater Independent*, of June 13th, 1896, reprinted in the *Meteorological Magazine* for September, pp. 117–119, is somewhat confusing to an American. The writer of that article speaks of a "small cyclone or whirlwind" which visited the neighbourhood of Bridgwater on June 9th, and says, "this somewhat rare phenomenon must not be confounded with the ordinary cyclonic disturbance or 'depression' which is the usual cause of the low barometer, rain and gales of the winter months, and which is generally of sufficient size to cover the whole of the British Isles." He then speaks of "the true whirlwind or cyclone, of which we have recently received such terrible accounts from America."

The confusion here is in the wrong use of the word *cyclone* *Cyclone* should be used only to designate the cyclonic disturbances, depressions, or LOWS, which bring us what, in ordinary conversation, we speak of as storms. These, as the writer above-quoted recognizes, are generally of sufficient size to cover the whole of the British Isles. The much smaller revolving storms, which are distinguished by having a narrow path, seldom over half-a-mile wide, which last at most but an hour or two, and which are comparatively rare in the British Isles and on the Continent, should be called "tornadoes." These are much more frequent and more violent in the United States than anywhere else, and have for that reason, and also because of Finley's thorough study of them during past years, come to be regarded as rather distinctively American phenomena. The "terrible accounts" of damage done in the United States during the past spring and early summer, to which the writer of the article on "Whirlwinds" refers, were accounts of destruction wrought by "tornadoes" and not, as he says, by "cyclones."

Meteorologists in this country as a rule now use the word whirlwind only when speaking of desert or dust whirls. Scott, in his "Elementary Meteorology" (pp. 381–2, 384–5), confines the use of the word tornado to the thunder squalls off the West Coast of Africa, and uses whirlwinds for such phenomena as that at Bridgwater on June 9th last. He apparently makes no mention of our American tornadoes. In Moore's "Meteorology" the word tornado is rightly used on pp. 241–2, in describing a small revolving storm which occurred in Dublin, April 18th, 1850. Dickson ("Meteorology," pp. 89 *et seq.*) includes under whirlwinds, desert whirls, waterspouts and tornadoes, but distinguishes between cyclones and tornadoes, and gives somewhat over a page to a description of our American tornadoes.

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As the Bridgwater tornado was but a very weak affair in comparison with most of our American tornadoes, it is perhaps rather natural to prefer the use of the word "whirlwind" in describing it, rather than to use the more formidable "tornado." I believe, however, that it would be well always to use the term "tornado" to designate any revolving storm, of small diameter, which has the characteristics of an American tornado, *e.g.*, the funnel-shaped cloud, the destructive inflowing and ascending winds, the accompanying thunderstorm, &c. There are, of course, tornadoes of various degrees of development and of violence; that at Bridgwater was a very weak affair judged by our standards, but still, as far as I can determine by the reprinted account. it had many of the characteristics of the tornado, and should, I believe, be designated by that name.

Very truly yours,

ROBERT DE C. WARD, F.R.Met.Soc.

Harvard University, Cambridge, Mass., U.S.A., Oct. 1st, 1896.

[We think that most English meteorologists would fully concur with Mr. Ward; but we believe that to the general public cyclone and tornado are almost synonymous, and would be applied indifferently to any wind developing destructive energy.—ED. *M.M.*]

ISOBARS.

To the Editor of the Meteorological Magazine.

SIR,—In the September number of the magazine Dr. Hellmann asks "Who first used the word *isobar*?" and he suggests "perhaps Mr. Babington." In a foot-note you state that Admiral FitzRoy used the word *isobarometric* in 1863—the fuller and original form of the word—but I find that Alex. von Humboldt, in his *Cosmos*, wrote in the year 1843, twenty years earlier, as follows:—"If we connect together by *isobarometric* lines those places which present the same · · · · atmospheric pressure · · · · we shall obtain curves," &c.—*See* Otté's transl. 1st Ed., vol. i., p. 321.

Yours very truly,

J. LARDNER GREEN, F.R.Met.Soc.

Tintinhull, Milford Hill, Salisbury, October 6th, 1896.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1896.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	68·4	26	32·8	24	58·6	41·5	40·3	71	114·7	24·0	·55	11	5·3
Malta	67·2	21	44·6	9	63·0	51·2	48·5	75	134·7	37·2	3·34	11	6·5
Mauritius	83·4	3	69·0	28	81·5	72·7	69·7	80	130·9	60·0	3·36	16	5·4
Calcutta	106·8	15	70·0	21	99·4	78·0	69·5	56	159·5	62·0	·05	1	1·3
Bombay	94·8	10	76·2	6	90·5	79·3	75·2	73	141·5	65·4	·00	0	2·1
Ceylon, Colombo	93·0	26	74·5	5	90·9	76·9	74·5	78	158·0	66·0	5·93	19	5·9
Melbourne	81·1	20	40·1	26*b*	67·7	50·0	48·4	69	127·9	31·5	2·71	12	5·5
Adelaide	89·9	4	46·0	28	73·0	54·4	49·2	59	142·1	36·4	3·00	14	5·2
Sydney	83·9	8	51·0	15	71·8	56·9	51·9	73	134·0	40·4	·15	3	2·4
Wellington	63·0	16	40·0	19	61·2	50·4	48·2	76	127·0	26·0	12·15	24	5·1
Auckland	78·0	1	47·0	18	68·2	55·1	51·5	70	131·0	38·0	7·20	20	5·8
Jamaica, Kingston	90·2	5	66·2	14	86·4	69·1	66·6	75	...	...	·86	5	4·0
Trinidad	93·0	24*a*	67·0	7, 8*c*	89·4	69·4	70·5	76	169·0	65·0	2·33	10	...
Grenada	86·2	12	71·0	13	82·9	73·4	67·2	71	155·0	...	5·91	15	3·1
Toronto	79·7	17	18·3	4	54·7	38·1	37·7	74	97·0	15·0	·76	14	6·0
New Brunswick, Fredericton	66·7	20	16·8	9	49·8	27·9	26·3	59	...	...	1·19	8	5·0
Manitoba, Winnipeg	75·3	26	−0·4	2	45·0	27·1	...	...	...	...	5·64	14	7·0
British Columbia, Esquimalt	64·1	24	29·2	3	53·1	38·7	39·8	82	...	...	1·08	14	7·0

a—and 28. *b*—and 27. *c*—20.

REMARKS.

MALTA.—Adopted mean temp. 56°·2, or 3°·6 below the average. Mean hourly velocity of wind 13·1 miles. Average temp of sea 60°·0. Thunderstorms on 8th, 10th and 28th. Lightning on 4th and 6th. Hail on 8th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·4 above, of dew point 1°·4 above, and rainfall 2·33 in. below, their respective averages. Mean hourly velocity of wind 9·4 miles, or 1·0 mile below average; extremes, 23·9 on 26th, and 0·0 on 18th; prevailing direction, E.S.E. Lightning on 3rd. Thunder and lightning on 4th, 15th, 16th, 20th and 21st. C. MELDRUM, F.R.S.

CEYLON, COLOMBO.—Thunderstorms occurred on 15 days. Lightning was seen on 7 days. D. G. MANTELL.

Adelaide.—Mean temp. 0°·4 below the average of 39 years. Rainfall 1·26 in. above the average. C. TODD, F.R.S.

Sydney.—Rainfall 5·68 in. below, temperature 0°·1 below, and humidity 5·6 below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—A most unpleasant month; showery almost throughout, and some heavy falls of rain. Wind chiefly from S.E. and N.W., and frequently strong. Thunder on 1st, 2nd and 24th. Temperature 1°·2 below, and rainfall 8·63 in. above, their respective averages. R. B. GORE.

Auckland.—An unusually wet month, the rainfall considerably exceeding twice the average. Barometric pressure and mean temperature both slightly above the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 3·5 miles. Rainfall in Kingston and the Island generally one-fifth less than the average. Hail at Christiana on 28th. R. JOHNSTONE.

TRINIDAD.—Rainfall ·30 in. above the average of 30 years. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, SEPTEMBER, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall.	8·00	XI.	Lake Vyrnwy	9·08
,,	Birchington, Thor	4·77	,,	Corwen, Rhug	5·53
,,	Hailsham	6·14	,,	Criccith, Talarvor	5·79
,,	Ryde, Thornbrough	9·52	,,	I. of Man, Douglas	5·59
,,	Emsworth, Redlands	7·89	XII.	Stoneykirk, Ardwell Ho.	3·80
,,	Alton, Ashdell	8·24	,,	New Galloway, Glenlee	6·30
III.	Oxford, Magdalen Col.	4·83	,,	Lilliesleaf, Riddell	5·42
,,	Banbury, Bloxham	4·85	XIII.	N. Esk Res. [Penicuick]	4·75
,,	Northampton, Sedgebrook	4·74	,,	Edinburgh, Blacket Pl.	4·47
,,	Alconbury	4·48	XIV.	Glasgow, Queen's Park.	4·71
,,	Wisbech, Bank House	3·93	XV.	Inverary, Newtown	6·29
IV.	Southend	3·57	,,	Oban, The Corran	6·71
,,	Harlow, Sheering	6·19	,,	Islay, Gruinart Schools.	3·60
,,	Colchester, Lexden	4·32	XVI.	Dollar	5·19
,,	Rendlesham Hall	3·83	,,	Balquhidder, Stronvar	7·90
,,	Rushall Vicarage	5·42	,,	Ballinluig	3·81
,,	Swaffham	5·23	,,	Dalnaspidal H.R.S.	8·19
V.	Salisbury, Alderbury	6·21	XVII.	Keith H.R.S.	4·75
,,	Bishop's Cannings	5·90	,,	Forres H.R.S.	3·83
,,	Blandford, Whatcombe	8·54	XVIII.	Fearn, Lower Pitkerrie.	2·83
,,	Ashburton, Holne Vic.	9·33	,,	N. Uist, Loch Maddy	5·43
,,	Okehampton, Oaklands.	7·70	,,	Invergarry	5·59
,,	Hartland Abbey	6·42	,,	Aviemore H.R.S.	4·38
,,	Lynmouth, Glenthorne.	6·82	,,	Loch Ness, Drumnadrochit	4·01
,,	Probus, Lamellyn	4·61	XIX.	Invershin	4·82
,,	Wellington, The Avenue	4·71	,,	Scourie	6·40
,,	Wincanton, Stowell Rec.	6·85	,,	Watten H.R.S.	4·09
VI.	Clifton, Pembroke Road	7·35	XX.	Dunmanway, Coolkelure	10·81
,,	Ross, The Graig	5·93	,,	Cork, Wellesley Terrace	5·60
,,	Wem, Clive Vicarage	3·49	,,	Killarney, Woodlawn	8·46
,,	Cheadle, The Heath Ho.	5·03	,,	Caher, Duneske	4·87
,,	Worcester, Diglis Lock	3·66	,,	Ballingarry, Hazelfort	5·64
,,	Coventry, Coundon	4·75	,,	Limerick, Kilcornan	5·97
VII.	Ketton Hall [Stamford]	3·75	,,	Broadford, Hurdlestown	5·28
,,	Grantham, Stainby	4·32	,,	Miltown Malbay	6·02
,,	Horncastle, Bucknall	3·42	XXI.	Gorey, Courtown House	5·54
,,	Worksop, Hodsck Priory	4·26	,,	Athlone, Twyford	5·53
VIII.	Neston, Hinderton	3·45	,,	Mullingar, Belvedere	5·95
,,	Southport, Hesketh Park	4·43	,,	Longford, Currygrane	-5·25
,,	Broughton-in-Furness	8·33	XXII.	Woodlawn	6·49
IX.	Ripon, Mickley	3·98	,,	Crossmolina, Enniscoe	6·36
,,	Melmerby, Baldersby	2·65	,,	Collooney, Markree Obs.	5·72
,,	Scarborough, Obs.	2·61	,,	Ballinamore, Lawderdale	...
,,	Middleton, Mickleton	3·44	XXIII.	Lough Sheelin, Arley	4·80
X.	Haltwhistle, Unthank	4·58	,,	Warrenpoint	5·09
,,	Bamburgh	3·58	,,	Seaforde	4·57
,,	Keswick, The Bank	7·81	,,	Belfast, Springfield	5·13
XI.	Llanfrechfa Grange	8·16	,,	Bushmills, Dundarave	4·99
,,	Llandovery	8·08	,,	Stewartstown	5·33
,,	Castle Malgwyn	5·93	,,	Killybegs	7·97
,,	Builth, Abergwesyn Vic.	12·30	,,	Lough Swilly, Carrablagh	5·88
,,	Rhayader, Nantgwillt	11·30			

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SEPTEMBER, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth.	Greatest Fall in 24 hours. Date	Days on which '01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	No. of Nights below 32°. On grass
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	5·51	+ 3·00	·73	12	22	71·9	8	39·6	21	0	0
II.		Maidstone (Hunton Court)...	7·71	+ 5·12	1·60	12	21	...	...	...	...	...	...
„		Strathfieldsaye	6·60	...	1·01	24	26	...	...	...	...	...	...
III.		Hitchin	5·85	+ 3·35	1·06	12	23	69·0	5	37·0	20	0	...
„		Winslow (Addington)	5·96	+ 3·29	1·10	12	22	69·0	8, 9	34·0	21	0	1
IV.		Bury St. Edmunds (Westley)	6·32	+ 3·62	2·10	1	21	66·0	9	42·0	30	0	...
„		Norwich (Brundall)	3·63	...	·63	24	21	72·0	9	40·0	21	0	0
V.		Weymouth(LangtonHerring)	6·76	+ 4·34	·96	3	25	68·0	9	45·0	21	0	0
„		Torquay (Cary Green)	5·45	...	1·08	21	28	67·1	26	45·6	21	0	0
„		Polapit Tamar [Launceston]..	6·17	+ 2·46	1·43	8	24	66·8	10	38·0	21	0	...
VI.		Stroud (Upfield)	5·27	+ 2·36	·85	4	25	68·0	15	41·0	20	0	...
„		ChurchStretton(Woolstaston)	4·96	+ 2·46	·86	24	26	67·0	10	41·0	28	0	...
„		Tenbury (Orleton)	3·95	+ 1·34	·74	24	23	67·8	27	33·5	21	0	1
VII.		Leicester (Barkby)	3·73	+ 1·09	·70	24	29	72·0	9	33·0	20	0	1
„		Boston	3·67	+ ·90	·73	12	20	71·0	10	38·0	21	0	...
„		Hesley Hall [Tickhill].....	3·71	+ 1·55	·61	4	26	70·0	11	35·0	21	0	...
VIII.		Manchester(PlymouthGrove)	5·28	+ 1·81	·80	22	24	73·0	9,10	40·0	28	0	0
IX.		Wetherby (Ribston Hall) ...	4·67	+ 2·21	·97	10	21	...	...	...	...	...	...
„		Skipton (Arncliffe)	8·89	+ 4·13	1·52	22	22	..	...	...	...	...	...
„		Hull (Pearson Park).....	3·83	+ 1·39	·63	24	20	70·0	13	36·0	21	0	1
X.		Newcastle (Town Moor)	2·27	— ·51	·70	25	17	...	...	...	...	...	...
„		Borrowdale (Seathwaite).....	15·26	+ 3·53	2·53	17	25	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	9·67	+ 5·93	1·53	21	25	...	...	...	...	...	...
„		Haverfordwest	6·69	+ 2·29	1·25	21	25	66·3	12	38·0	21	0	0
„		Aberystwith (Gogerddan) ...	7·28	+ 3·01	1·20	24	23	71·0	12	30·0	29	2	...
„		Llandudno.....	4·77	+ 2·55	·84	4	24	68·0	10	43·8	21	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	5·50	+ 1·94	·92	24	18	70·4	1	34·0	21	0	0
„		Jedburgh (Sunnyside).....	3·98	+ 1·29	·70	16	28	69·0	10	38·0	22*d*	0	...
XIV.		Colmonell	4·89	...	1·28	27	20	72·0	3	33·0	20	0	...
XV.		Lochgilphead (Kilmory).....	7·01	+ 1·88	1·30	18	21	...	...	35·0	20	0	...
„		Mull (Quinish).....	5·78	+ ·75	·94	18	22	...	...	...	...	...	...
XVI.		Loch Leven Sluices	4·00	+ 1·21	·60	10*a*	15	...	...	...	...	...	...
„		Dundee (Eastern Necropolis)	3·85	+ 1·34	·75	9	21	67·0	12	37·1	26	0	...
XVII.		Braemar	4·01	+ 1·15	·76	27	21	63·2	4	31·0	21	1	7
„		Aberdeen (Cranford)	4·33	...	·75	22	26	63·0	14*b*	32·0	27	1	...
XVIII		Strathconan [Beauly]	6·57	+ 2·89	1·08	23	17	...	...	...	...	...	...
„		Glencarron Lodge.....	7·76	...	·93	17	20	69·8	12	34·0	27	0	...
„		Cawdor	3·94	+ 1·19	·77	27	24	...	...	...	...	...	...
XIX.		Dunrobin	4·67	+ 2·08	·77	22	21	62·0	3	38·0	26	0	...
„		S. Ronaldsay (Roeberry).....	4·73	+ 2·07	·90	17	23	61·0	3	39·0	25	0	...
XX.	IRELAND.	Darrynane Abbey.....	5·81	...	·74	24	25	...	...	...	...	...	...
„		Waterford (Brook Lodge) ...	6·12	+ 3·20	·96	24	21	68·5	10	36·0	3	0	...
„		O'Briensbridge (Ross)	7·23	...	·94	24	24	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	5·93	+ 3·11	·93	24	24	...	...	...	...	...	...
„		Dublin (FitzWilliam Square)	5·07	+ 3·10	·95	4	23	68·4	17	41·1	21	0	0
XXII.		Ballinasloe	5·73	+ 2·94	1·03	24	25	64·0	4, 6	34·0	21*e*	0	...
„		Clifden (Kylemore)	9·15	...	1·85	24	24	...	...	...	...	...	...
XXIII		Waringstown	4·98	+ 1·82	·95	24	26	71·0	12	35·0	20	0	1
„		Londonderry (Creggan Res.).	5·19	+ 1·41	·81	26	24	...	...	...	...	...	...
„		Omagh (Edenfel)	4·89	+ 1·51	·86	24	26	68·0	10*c*	35·0	20	0	0

+Shows that the fall was above the average ; —that it was below it.

a—and 15. *b*—and 15, 17. *c*—and 12. *d*—and 30. *e*—and 30.

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METEOROLOGICAL NOTES ON SEPTEMBER, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

LONDON, CAMDEN SQUARE.—During the 38 years over which observations extend, no other September had so large a rainfall, the greatest being 5·28 in. in 1871. It is the wettest month since October, 1880, and in the 38 years there have been only five wetter months.

HITCHIN.—Only four wetter months since this record began in 1849; in the first 14 days 4·24 in. fell.

ADDINGTON.—The greatest rainfall ever recorded here in September. On the 25th a great gale did much damage to the apple crop. On the 8th a very heavy TS commenced about 10 p.m., the L being particularly vivid, and one clap of T unusually heavy.

BURY ST. EDMUNDS, WESTLEY.—The wettest month since the register began in 1857, more than 5·00 in. having been recorded in only 8 months during that time. T on 1st; distant T on 11th, 12th, 13th and 20th; TSS on 9th, 10th and 28th.

NORWICH, BRUNDALL.—A rough, rainy month, the wettest September since 1885; R ·97 in. above the average, but the total for the year still 3·55 in. deficient. On 10th ·22 in. of rain fell in 10 minutes. L on 9th, 13th, 19th and 24th; T on 1st, 9th and 13th; H on 13th and 20th; strong gales on 23rd and 25th.

WEYMOUTH, LANGTON HERRING.—By far the wettest September in the last 22 years; the next wettest were 1876 5·50 in., and 1883 4·52 in. The rainfall for September exceeded the aggregate of the five preceding months by 2·27 in. The total for the 9 months is 81 per cent. of the average. Mean 9 a.m. temp. 57°·6, or 0°·4 below the average of 24 years. Solar halo on the 24th, followed by a great gale on the night of the 24th and 25th, which uprooted many trees. TS on the 8th.

TORQUAY, CARY GREEN.—Rainfall 3·22 in. above the average; the fall of 9 months, January to September, being 8·42 in. below the average. Mean temp. 57°·9 or 0°·1 below the average. Duration of sunshine 105 hours, being 59 hours 25 minutes below the average. Two sunless days.

POLAPIT TAMAR [LAUNCESTON].—An exceptionally wet month, in marked contrast to September, 1895, both as regards R and temp. The last 10 days were generally very wild and stormy. The R on the 8th (1·43 in.) has been exceeded only on five occasions during the past 16 years. N.W. gale on 25th; foggy on 26th.

STROUD, UPFIELD.—TS at night on 7th; S.W. gales on 17th and 22nd; severe N.W. gale on 25th; trees blown down.

WOOLSTASTON.—A wet month, there being only four days on which no R fell. Violent storm of T and L with very large H on the 12th. The church here was slightly struck, and several pieces of stone chipped off the font. Heavy gale on the 24th, with wild and stormy weather for some days. Mean temp. 54°·5.

TENBURY, ORLETON.—A cold, wet month, with a rainfall considerably in excess of the average, and the largest amount in September since 1883. Although the days were cold and there was very little sunshine the mean temp. of the month is 1°·3 above the average of 35 years. L on the 8th, and T on the 9th and 20th.

LEICESTER, BARKBY.—R fell on the last two days of August, and on 29 out of 30 days in September. Mean temp. 55°·1. Water in Leicester still slightly

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restricted, the late gain being used for storage. The first five months of the year gave 5·16 in. of rain, the last four months 12·32 in. L and T on 8th, 9th, 12th and 20th, and T on 10th.

MANCHESTER, PLYMOUTH GROVE.—The wettest September since observations commenced in 1868, with the exception of September, 1869, when 5·67 in. fell, and 1872 6·79 in. Mean temp. 57°·5.

WALES.

HAVERFORDWEST.—The wettest and most stormy September since 1883, which proved disastrous to the late hay crops and the cereals on the high lands; root crops very much benefited by the R. Gales of exceptional violence on the 21st, and 24th–25th, the latter doing considerable damage to roofs and buildings. On the whole a very equable month as regards temperature.

ABERYSTWITH, GOGERDDAN.—Stormy throughout, and a very strong gale on 25th and 26th.

SCOTLAND.

CARGEN [DUMFRIES].—Exceptionally heavy R and absence of sunshine made this one of the dreariest and dullest Septembers ever experienced. Heavier rainfall was recorded in 1885 (7·30 in.), and 1869 (8·20 in.), but never has so little been seen of the sun; the hours of sunshine being less than half the average. The mean bar. pressure has not been lower since 1869. In the 16 days 14th to 29th, the R on 14 exceeded ·10 in. For the nine months of the year the total is 2·19 in. below the average. A severe gale from S. occurred early on 27th, and T and L on 12th, 15th, 19th and 27th. As a consequence of the unfavourable weather, little progress was made with harvest, and considerable damage has been done to the corn still outstanding.

JEDBURGH.—The rainfall is remarkable for quantity and persistence during the month. This retarded the ingathering of cereal crops very much, and to a certain extent caused damage, not, however, to any grave extent. The turnip crop is very good, and grass lands are in fine condition.

COLMONELL.—Rainfall ·91 in. above the average of 20 years. Mean temp. 55°·4 or 2°·0 above the average.

MULL, QUINISH.—Very fine weather from 1st to 13th, thence to the end of the month a succession of gales from all quarters, with T and H on 15th and 16th.

BRAEMAR.—A cold, bleak and disagreeable month. Sunshine 76 hours 20 minutes only.

ABERDEEN, CRANFORD.—Little sunshine during the month, and much fog in the first fortnight. Bad harvest weather.

S. RONALDSAY, ROEBERRY.—A very wet unsettled month. Mean temp. 50°·4, 1°·4 below the average of six years.

IRELAND.

DARRYNANE ABBEY.—A very wet month, and the second half very wild and stormy.

WATERFORD. BROOK LODGE.—Dense fog on 3rd. T on 9th and 12th, L on 11th and 12th. Heavy gale on 22nd, and gales on 25th and 27th.

O'BRIENSBRIDGE, ROSS.—A very bad harvest month and much injury to crops. Very violent gale for three hours on 24th.

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DUBLIN.—Unlike the Septembers of 1893, 1894, and 1895, all of which were fine and summer like, this month was unsettled, stormy, and excessively wet throughout. The mean temp. 55°·8 is exactly equal to the average; the mean atmospheric pressure was however largely in defect. The rainfall is the greatest on record, being more than double the average. High winds were noted on 15 days, and attained the force of a gale on 14th, 16th, 17th, 22nd, 23rd 25th and 27th. L on the 9th, 10th, 12th and 27th. Foggy on the 4th and 9th; H on 19th; lunar halo on 16th, solar halo on 18th.

WARINGSTOWN.—The R of September, 1896, has only once been equalled since the record commenced in 1861, viz., in 1882, when exactly the same amount fell in September as this year; but it fell on 18 days instead of 26, and consequently was not so detrimental to the harvest. Much of the oat crop is still out, and some of it seriously damaged.

OMAGH, EDENFEL.—Although the rainfall of September, 1896, has been exceeded three times in the 32 years recorded here, viz., 1872, 1879 and 1885, it is doubtful if in any of those years the fall was more persistent or the atmospheric conditions more disturbed; the wind, temperature, and pressure daily undergoing sudden and sometimes violent changes. The damage done to the crops has been accordingly very serious, and exceeds that of the above years in proportion to this year's more abundant promise.

TORNADO IN PARIS.

ABOUT 3 p.m. on September 10th, a tornado passed over Paris. It began at the Place St. Sulpice and ended at the Boulevard de la Villette, a distance of nearly two miles. The apparatus at the Meteorological Bureau and the Eiffel Tower were not affected by it, as they are not within that area. M. Angot, head of the Meteorological Bureau, was at the Pont Royal, about to take a boat, when he noticed small dark clouds, very low down, apparently moving against the wind, which was not at all high, the velocity not being more than five or six yards a second. He soon perceived that the clouds had a rapid circular motion, not horizontal, but oblique. He believes that the tornado, when he first observed it, was a mile distant, and that its diameter was about 170 yards.

The meteorologist at the Tour St. Jacques states that the storm lasted less than a minute. Some black clouds passed swiftly overhead and there was one flash of lightning. The barometer suddenly fell from 748mm. to 742mm., but immediately rose again. An omnibus was overturned on the Pont au Change and another in the Place du Châtelet, and in the Rue de Harlay a cab was thrown over and the driver killed. Stalls in the flower market in the Place St. Sulpice were carried away, and an omnibus driver was blown from his seat and broke his leg. One side of the Palais de Justice had its windows broken and part of the roof blown off. The roofs of the Opéra Comique, the Châtelet, and the Tribunal of Commerce, were damaged, and the Prefecture of Police had two heavy doors wrenched off, and a sentry box carried some distance away. Kiosks and shop fronts were shattered and tables and chairs outside cafés were carried away. In addition there is the usual list of trees torn up, and chimneys overthrown. Seven persons were killed and many seriously injured, several of whom were not expected to recover

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXX.] NOVEMBER, 1896. [PRICE FOURPENCE, or 5s. per ann. post free.

THE CLIMATE OF THE BRITISH EMPIRE IN 1895.

OUR annual climatological table for 1895 presents one unusual feature. The highest shade temp. was recorded at an East Indian station, the 107°·2 at Calcutta being apparently the highest reading there in the past 15 years, while Adelaide, which usually heads the list, recorded a maximum well below the normal.

The other extremes set out in the summary, fall so regularly to certain stations that they call for little comment. For extreme cold and range of temperature, Winnipeg is unapproachable, while year after year Ceylon shows the smallest total range, the highest mean temp. and the greatest rainfall. Malta, again, one is quite prepared to see with the smallest rainfall. The greatest and least amounts of cloud, perhaps, fall less regularly to any given station than the other elements; but Esquimalt and Bombay have frequently appeared for the two extremes. Jamaica, on the other hand, appears for the first time. Adelaide, usually prominent in the summary of extremes, this year retains its place only as the driest station.

Summary.

Highest Temp. in Shade ...	107°·2 at Calcutta, on May 20th.
Lowest „ „ ...	—45°·5 at Winnipeg, on Feb. 5th.
Greatest Range in Year ...	133°·8 at Winnipeg.
Least „ „ ...	26°·9 at Colombo, Ceylon.
Greatest Mean Daily Range	23°·0 at Winnipeg.
Least „ „ „ ...	10°·3 at Mauritius.
Highest Mean Temp.	81°·7 at Colombo, Ceylon.
Lowest „ „	34°·5 at Winnipeg.
Driest Station	Adelaide, mean humidity 59.
Dampest Station	Esquimalt, „ „ 89.
Highest Temp. in Sun	178°·0 at Trinidad.
Lowest Temp. on Grass ...	—27°·0 at Toronto.*
Greatest Rainfall	92·23 in. at Colombo, Ceylon.
Least „	11·38 in. at Malta.
Most Cloudy Station.....	Esquimalt, average amount 6·6.
Least „ Stations	Bombay and Jamaica, aver. amount 3·9.

* The min. on grass is not recorded at Winnipeg.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1895.

Stations. *Those in Italics are South of the Equator.*	Absolute.				Average.					Absolute.		Total Rain.		Average.
	Maximum.		Minimum.		Max.	Min.	Mean.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.										0—10
	°		°		°	°	°	°		°	°	in.		
England, London ...	86·2	May 30	7·3	February 8	57·9	41·8	49·9	41·8	78	135·3	5·0	21·47	137	5·8
Malta	103·6	July 5	34·2	February 19	73·5	59·6	66·5	56·9	75	159·0	31·7	11·38	67	4·5
Mauritius	89·5	February 18	54·8	June 22	79·6	69·3	74·5	65·3	76	137·3	45·6	54·16	196	5·7
Calcutta	107·2	May 20	47·4	December 25	86·7	70·3	78·5	68·6	74	160·5	38·0	39·38	74	4·1
Bombay	93·8	June 7	60·8	January 23	85·8	74·9	80·4	71·5	75	144·5	49·8	67·59	109	3·9
Ceylon, Colombo ...	93·7	May 1	66·8	January 31	87·7	75·6	81·7	71·7	77	157·0	55·0	92·23	201	5·4
Melbourne	100·6	February 13	29·5	June 17	68·2	49·6	58·9	47·7	69	155·9	20·4	17·06	131	5·2
Adelaide.....	105·4	Feb. 12, 13	36·9	May 26	73·0	53·5	63·3	48·1	59	174·0	29·6	21·27	130	4·7
Sydney	96·1	December 15	36·8	July 9	69·8	56·3	63·1	54·1	73	157·2	24·6	31·89	173	4·6
Wellington.....	88·0	February 20	32·0	July 13, 26	61·2	49·1	55·1	46·3	72	145·0	20·0	61·49	176	4·8
Auckland	85·0	February 18	37·0	July 21 / August 3	64·6	52·5	58·5	49·7	73	145·0	32·0	44·15	203	5·3
Jamaica, Kingston..	94·6	August 17	62·8	December 21	87·5	71·1	79·3	68·9	76	...	...	20·89	78	3·9
Trinidad.....	95·0	May 11	63·0	Feb. 5, 25	87·9	69·6	78·7	70·4	76	178·0	62·0	62·23	178	..
Toronto	93·4	May 30	—21·2	February 6	52·9	35·6	44·2	36·9	75	109·5	—27·0	28·04	161	5·7
Manitoba Winnipeg	88·3	August 15	—45·5	February 5	46·0	23·0	34·5	...	...	...	...	18·42	148	5·9
British Columbia, Esquimalt	82·0	May 16	20·1	November 5	55·4	41·6	48·5	44·1	89	...	...	32·40	188	6·6

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THE SCIENTIFIC USE OF KITES.

In February, 1895, we gave in these pages some particulars respecting Mr. Rotch's efforts to obtain records of temperature, &c., at great heights by means of kites, and quoted some of the results which had been obtained at the Blue Hill Observatory in July and August, 1894.

In the *Met. Mag.* for August, 1896, Mr. Rotch pointed out that the credit of priority in this field of work belonged to a Scotchman, Dr. Wilson, who had used tandem kites in 1749.

The following paragraph shows how extremely successful Mr. Rotch's staff at Blue Hill have been :—

> The observers at the Blue Hill Observatory, near Boston, Mass., report that a 3lb. meteorograph, made by Richard, of Paris, was raised by them by means of 2⅛ miles of piano wire, on July 20th, to a height of 5,961 ft. above the hill, thus breaking all kite-altitude-records. Three Eddy kites, made by Fergusson, passed through and beyond the clouds, and were only visible at intervals between breaks in the clouds. The kites and instruments remained at the highest point half-an-hour, and exerted a pull of from 110 to 120lb. The meteorograph showed that the air was very dry above the clouds, and about 18° colder than at the earth's surface.

But this was far surpassed on October 8th, of which the following is the account in the *New York Advertiser* :

> William A. Eddy, of Bayonne, N. J., has received from the observers at the Blue Hill Observatory, near Boston, the definite particulars of the extremely successful kite flying test which they made on October 8th.
>
> The ascension was to an altitude never before reached. The operators sent their meteorograph to the height of 9,385 ft. More than three miles of piano wire was paid out, the ascension beginning at 9.5 in the morning and ending at 9.15 in the evening. When the highest point was reached, the pull on the wire was from fifty to ninety-five pounds.
>
> The instrument entered and passed through the clouds as shown by the record of a very dry air above the clouds. The temperature fell from 46 degrees on the hill to 20 degrees at an altitude of 8,750 ft. The meteorograph record, in ink, on a revolving cylinder run by clockwork, was the best and clearest yet obtained. The recording apparatus was more than a mile high during three hours.

The Americans are now giving great attention to the subject, and Prof. Willis Moore, the Chief of the Weather Bureau, has detailed Prof. Marvin and other members of his staff for study of this branch of meteorological research. With the ample resources of the U.S. Weather Bureau, remarkable developments may reasonably be expected, and we certainly wish the Bureau every success. The

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Monthly Weather Review (which, under Prof. Cleveland Abbe's able editorship is becoming a sort of American Meteorological Magazine) has recently contained a series of articles by Prof. Marvin on the History, and Theory of the Meteorological use of Kites, with reference especially to their form and construction. We understand that besides the experiments at Washington, the Weather Bureau is having others made in California, Montana, and Michigan.

It may merely betray our own ignorance, but there is one point on which we have seen no statement. A kite can go up only when there is wind, a balloon can go up in a calm; a kite cannot carry as much weight as a balloon. Why are kites better than captive balloons?

The last (July) number of the *Monthly Weather Review* gives the following interesting report from the far North-West—just E. of the Rocky Mountains:—

KITES IN MONTANA.

By Mr. A. B. Coe.

From the recent letters received from Mr. R. M. Crawford, director of the Montana section of the Climate and Crop Service, and from Mr. A. B. Coe, voluntary observer at Kipp, Montana (N. 48° 45′, W. 112° 45′, elevation about 4,000 ft.), we take the following notes, and hope that others may be led to pursue similar studies with the same enthusiasm. Mr. Coe says:

I herewith transmit an account of a little experiment tried recently, employing a cellular kite of the dimensions described in the November, 1895, *Weather Review* for the purpose, and my maximum thermometer.

A phase of our climate at this station is the frequent veering of the wind from westerly points to north or north-east, accompanied by an extremely rapid fall of temperature, and usually more or less precipitation.

I have often thought that these cold waves did not reach very high up, and that at no great height above them the warm south-west wind still prevailed. For several days prior to July 19th, 1896, my maximum had been climbing up into the nineties too frequently for comfort. The air was dense with smoke, when the wind suddenly veered to the north-east, blowing steadily at about 15 or 20 miles an hour, and pretty thoroughly clearing the atmosphere of smoke. The temperature fell 51° in the next twenty-four hours, and on the 21st the clouds were dragging on the ground, and precipitating both rain and snow. At 11.30 a.m., on that date, my minimum thermometer registered 32°, but only for about twenty minutes, when it rose to 38°. From occasional glimpses of the sun obtained through breaks in the clouds, and from its red appearance, it was evident that there was another current of air full of smoke at a low altitude, blowing from the west, and undisturbed by the cold wave from the north-east beneath it.

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The time and circumstances seemed propitious to test my theory, so I climbed to the top of a hill near my home, which I found by triangulation to be about 200 ft. above my usual place of observation. Thither I bore my tailless kite, maximum thermometer, and 4,800 ft. of No. 24 twine, tagged at every 100 ft. for convenience in computing elevation. I secured the thermometer firmly in a pasteboard tube, open at both ends, and fastened this to my kite with wire. At 1.15 p.m. the surface temperature was 38°, when with the help of an assistant I soon had both kite and instrument mounting steadily upward on a flight of exploration.

I will have to add right here that my kite is a "stayer," and the only one of any description I ever made that would fly. I let it run out 1,000 ft., and on drawing it in found there was no difference in its registration. Again I let it out, and it was not until 3,900 ft. of twine had unreeled that any change in its action was observed; then I noticed that the kite above the fog and clouds was pulling nearly north-east, instead of south-west, as at first. Upon pulling it in, during which operation it again assumed its strain to the south-west, I was overjoyed to discover that the register stood at 77°, while at the point where I stood it remained at 39°. Being anxious to make sure that there was no mistake, I sent the instrument up again, and obtained a like result at about the same altitude, the kite going through the same movements as at first; but whether my observation is of any value aside from the personal satisfaction derived, is a question.

I anticipate some interesting experiments this coming winter in this direction, to determine, if possible, at what elevation the warm winds locally termed "chinooks" blow, at times when their influence is felt many miles east of this point, while remaining intensely cold here.

In response to a request for further data as to the protection of his thermometer and other matters. Mr. Coe writes:

I employed a strong pasteboard tube 12 in. in length, and 1¾ in. in diameter for the purpose. In this I sewed my maximum thermometer securely with strong pack thread, and packed fine cotton around each end for the better protection of the tube. Directly over the tube I cut a slit ¼ by 8 in., so that the scale could be readily seen without removing the instrument. Four feet from the belly-band I secured the tube to the twine with fine wire. The wind was blowing a good stiff breeze at the time, probably 20 miles an hour, and from the time the kite was let go until pulled in 23 and 25 minutes, respectively, elapsed, and the difference in temperature at each trial was the same as stated. My kite rose and descended very steadily without diving or pitching, so that I could not well believe that the difference in temperature was caused by any condition other than an upper current of warm air, blowing from the south-west at that altitude. The clouds near the earth were very dense, while from another experiment tried at the same time, I am satisfied that the kite passed through the clouds into bright sunshine. I secured a strip of sensitized paper between two thin pieces of mica, and sent it up attached to the kite, and exposed a similar piece to the light on the ground, in a like manner to protect the paper from dampness. While the paper at my feet remained unchanged in colour to any extent the piece sent up was changed to a bronze black.

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ESCHUID-ASHINDON.

To the Editor of the Meteorological Magazine.

SIR,—In reply to Dr. Hellmann, the following is extracted from "Memorials of Merton College," (Oxford Historical Society) by the Hon. G. C. Brodrick, Warden (p. 200).

"John Ashindon or Ashinden, also called Eastwood (1338), according to Anthony Wood was the greatest mathematician and astronomer ever produced by Merton College, as well as an eminent physician. In these researches he was aided by his brother Fellow, William Rede, and published treatises in concert with him, besides several under his own name. His works are cited with great respect by Pico de Mirandola. Anthony Wood dates from him a succession of mathematical and astronomical students at Merton, extending over at least a hundred and fifty years after his time. But he (Anthony Wood) adds that nearly all their works disappeared from the College library—probably together with many hundred volumes of school divinity—during the visitation in the early part of Edward VI.'s reign, when such books relating to natural science, being regarded as profane, if not diabolical, were burned, or sold as waste paper. Not less than a cartload of valuable MSS. are said to have been thus abstracted from Merton College Library. This statement Anthony Wood makes on the authority of Thomas Allen, 'the famous mathematician of Gloucester Hall,' in the reign of Queen Elizabeth, whose evidence was reported to Wood himself by John Wilton, Chaplain of Merton."

Yours truly,

C. E. PEEK.

Rousdon Observatory, Devon.

To the Editor of the Meteorological Magazine.

SIR,—In reply to Dr. Hellmann's letter, *re* Eschuid, in the *Met. Mag.* of September, may I refer him to *Notes and Queries* of November 23rd and December 7th, 1895, pp. 409, 452; January 18th, February 22nd and March 14th, 1896, pp. 52, 152, 218; July 25th, 1896, p. 83?

Yours truly,

FRED. COVENTRY.

Duddington, Stamford, Sept. 24th, 1896.

ISOBARS.

To the Editor of the Meteorological Magazine.

SIR,—I have found an earlier use of the word Isobar: *H. K. W. Berghaus* in 1838. In the text accomanying his Physical Atlas (p. 63) he calls isobars (Isobaren) the lines of mean equal atmospheric pressure at the level of the sea.

The isobarometric lines which Mr. J. Lardner Green mentions in

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the magazine, p. 138, are not lines of equal pressure, but lines of mean equal oscillation of the barometer first drawn by L. F. Kämtz, in 1832 (*Lehrbuch der Meteorologie* Band II., s. 339, and pl. III.). Kämtz remarks in a foot-note that *the* name adopted by him is not quite right, as isobarometric lines indicate properly lines of equal pressure, but he excuses himself with a sentence from A. Kircher, "in verbis simus faciles." Just for this reason Berghaus adopted the new word isobars for lines of mean equal pressure, which at that time were still supposed to run parallel to the equator, although G. A. Erman had previously (in 1831) pointed out that the mean atmospheric pressure varies not only with the latitude but also with the longitude (Poggendorff's Annal. XXIII., 144).

G. HELLMANN.

Berlin, October 18th, 1896.

METEOROLOGICAL OBSERVATIONS IN SCHOOLS.

Prepared for the Connecticut State Board of Education by ROBERT DE C. WARD, Instructor in Meteorology in Harvard University.

THE time has come when meteorology should be systematically taught in our schools. It is a subject of the greatest practical interest and importance. It lends itself very readily to teaching. It trains those who study it, in habits of scientific thought and investigation, Already in many of our grammar and high schools some meteorological instruction is given, and the keeping of meteorological records by scholars is every year becoming more general. As yet, however, there is no *system* in all this work, and, in consequence, much that is being done is wasted effort, without definite result. The present circular is designed to indicate some of the lines along which the elementary study of meteorology should proceed in order to be most thorough and most useful.

The children themselves, even in the earliest primary school years, take the first step towards an understanding of our ordinary weather changes. They unconsciously notice whether a day is fair or rainy, hot or cold, a pleasant one on which to be out, or one on which they would rather stay indoors. These facts are temporarily impressed upon their minds when they start for school; when recess time comes; and when they go home. If it is raining or snowing, they need umbrellas and rubbers [goloshes]; if it is cold, they need overcoats; if it is windy, they find it hard to walk; if it is icy, they can enjoy themselves sliding on the ice; if there is soft snow on the ground they can make snowballs; if it is very hot, they prefer to walk in the shade. We are all so directly affected by the weather conditions prevailing at any moment, that even the youngest school children are forced (unconsciously, to be sure) to take some notice of these conditions. Here lies the first work of the teacher who wishes to teach her scholars something rational as to the simpler facts of meteorology.

The first step is to make the children intelligent observers of

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weather changes and conditions, instead of leaving them merely blind, unconscious subjects, as they otherwise are. This introductory work on the part of the teacher is simple, and, if entered upon with enthusiasm, becomes very helpful to both teacher and scholars. It may be briefly sketched as follows: When the children come to school on some snowy winter day, with a violent north-east wind, chilling and damp, attention may be called to the need of overshoes and overcoats; to the fact that the snow should be shaken off the clothing in order to prevent the latter from becoming wet; to the piling up of the snow in deep drifts at certain places near the school or in the town, while in other places the ground is left bare; to the ease with which snowballs may be made, and to other facts which will very readily suggest themselves. A day or two after such a storm, when the sun is shining brightly in a cloudless sky; when there is no wind and the air is dry, cold, and crisp, the contrasts between these two weather types should be brought out. Instead of snow we now have sunshine; instead of a damp, chilling north-easter we now have a calm, and the air is dry; snowballs cannot easily be made in the early morning, because the snow is frozen hard and is too dry, but towards noon, if the temperature rises high enough, there may be thawing on the tops or sides of the snow-drifts, and there the snow becomes soft enough for snow-balling. Another weather type, often noted during our New England winter and strongly contrasted with both of the preceding conditions, is that which brings us a warm, damp, southerly wind, frequently accompanied by heavy rains. As these damp winds blow over snow-covered surfaces they become foggy and the ground is said to "smoke;" the heavy rain rapidly melts the snow; slush and mud make bad walking; rivers and brooks rise rapidly, perhaps overflowing their banks; low-lying places become filled with standing water. These and other features should all be brought out by the teacher, not by telling the children of them directly, but by judicious questioning, and they should be contrasted with the conditions which may immediately follow, when the storm has cleared off, and when the low temperatures brought by a "cold wave," with its dry north-west wind, have resulted in freezing lakes, rivers, and brooks; when skating and sliding may be indulged in, and when hot fires are a necessity.

Early summer weather conditions, with their accompanying warm spells, thunder storms, and sea breezes, furnish another long list of typical changes that should be just as carefully noticed and described as the more striking winter characteristics—in fact, these examples might be extended indefinitely. Enough has, however, been said to indicate the lines along which this preliminary training of the children should proceed. The central idea should be to train the scholars in intelligent weather observation, so that they may come to appreciate what our typical weather changes are; that they may recognize the types as they recur over and over again, and may see

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how each example differs from, or accords with, those that have preceded it. In this way, by spending only a few minutes a day on the subject, the teacher may soon bring her children to the point of being intelligent, rational observers, and by the end of the primary school years they should have in mind, not only our typical weather changes, but the larger facts of seasonal change as well.

This simple method of getting an appreciation of our seasonal and daily weather types is a very important step towards a rational understanding of the larger facts of meteorology. It should, in all cases, precede the next step—observations with instruments.

In the instrumental work, which may usually be begun in the early years of the grammar school course, it is not well to attempt anything more than records of temperature, wind direction and velocity, and rain and snowfall. Current observations without the use of instruments should, however, be made in addition, such observations including the state of the sky (clear, fair, cloudy); the kind of precipitation (rain or snow), &c., together with any other notes as to peculiar features which may happen to be noticed day by day.

Temperatures are of course registered by thermometers. For school use a good mercurial thermometer, costing $2 or $3 (say 10s.), should, if possible, be purchased.*

Ordinary thermometers, costing 50 cents or $1 [2s. to 4s.], are inaccurate, and records from them are of little value. The thermometer ought to be hung away from any building, in the shade, about four feet above a grass-covered surface, but as this is in most cases impossible or impracticable, it does sufficiently well for general purposes if the instrument is fastened outside a north window, at least 1 ft. away from it, and so arranged that it can be read from inside without opening the window. If possible, a window should be selected which is seldom opened.

Wind directions may be taken from the indications of a neighbouring vane, but care should be taken to see that the vane is in good working order. Wind velocities may be roughly estimated as, calm; light; moderate; strong; gale.

Rain may be measured by means of an ordinary lard pail, or even a tomato can with the top cut off evenly and sharply. This should be set in an open space, away from trees and buildings, and ought to be so arranged that it can be fastened to a short stake to prevent its blowing over. The depth of water in the can may be measured, roughly, with a foot rule, divided into inches, quarters, and eighths. In the case of snowfall, which is difficult to measure satisfactorily, the best way is to select some flat space where the snow has not drifted and then to press the inverted can down on the snow, thus cutting out a circular section of snow. By means of a thin board,

* A mounted mercurial thermometer, of the Weather Bureau pattern, can be purchased from Julien P. Friez, 107, East German Street, Baltimore, Md., for $3 [12s.]

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or a shovel pushed under the can, the snow inside the can is retained, and the can with its contents may be taken indoors. There the snow should be melted and the depth of water it produces measured.

These are, of course, very simple and very crude observations, but they are all that can be attempted in most schools, and are certainly all that can well be attempted at the start in any case. If the older scholars are especially interested, the instruments may easily be added to. Maximum and minimum, and wet and dry bulb thermometers; a standard rain-gauge, a barometer, &c., may be secured, and much fuller records kept, but these additional instruments are somewhat expensive, and their care and observation require much time.

Now, when should these simple records be made, and how should they be preserved? The answer to these questions ought to be left to the scholars themselves to work out. They will probably begin by thinking one observation a day quite sufficient, and they will perhaps prefer to take this in the morning, before school opens. It is a good plan to have a different scholar assigned to the duty of taking the observations every day, the better scholars being given this piece of work as a sort of reward, and it is also advisable to have the daily weather record written upon the blackboard so that all can see it. The teacher should lead the scholars to see that only one observation of the temperature a day does not serve to give a fair average for that day. The temperature usually rises towards noon, and a reading of the thermometer made at 8.30 or 9 a.m. is often much too low for the actual temperatures experienced in the early afternoon. In this way, by judicious questioning and suggestions, the children will soon come to see the need of several observations of the temperature, the wind direction and velocity, the state of the sky, &c., and in time it may be so arranged that an observation can be taken every hour during school days. One reading of the rain gauge a day will, however, usually be sufficient.

At the end of each day the blackboard data should be entered in a permanent record book by some one of the scholars, and some ingenuity can be exercised in devising the best scheme for keeping this record. The record book should be carefully preserved in the schoolroom, where it may be referred to by the scholars of future years when any unusually severe storm, or a spell of excessively hot or dry weather, or a remarkable "cold wave" occurs, in order that comparison with past occurrences of a similar kind may be made. The keeping of such a record-book teaches the children neatness and punctuality; the adding up of the monthly and weekly temperatures and rainfall, trains them in simple arithmetical work; the taking of the observations gives them a feeling of responsibility which makes them accurate and attentive.

Just as the children have, in their earlier, non-instrumental observations, become familiar with the typical weather changes, so they now have their eyes opened to the discovery of other new facts

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unknown before. Among these discoveries, which the brighter children will soon make, are the following: The temperature noted during the day, especially during the summer half-year, is prevailingly higher about noon, and in the early afternoon, than in the morning or at night. This, of course, is seen to depend on the sun, and thus the marked control of the sun over our temperature distribution is brought out. In winter this simple diurnal temperature distribution is very often entirely obliterated by the conditions brought about by the passage of storms, which come at irregular intervals, and whose warm and cold winds control our winter temperatures to a great extent. This winter storm control of our weather and temperature, as distinguished from the solar control so characteristic of summer, is one of the marked features of our climate. The relation of certain directions of the wind to certain kinds of weather conditions is soon noted, and in this way a set of simple rules for local weather prediction may be framed. The increase of wind velocity towards noon in summer, with calms in the early morning and at night, cannot fail to be detected by the brighter children.

The diurnal growth of clouds, too, with a maximum cloudiness in the early afternoon and clear sky at night, often noted in summer, must soon appear as a characteristic feature of our spring and summer weather conditions. On clear, calm winter days, temperature readings made in the morning and evening from thermometers at some distance above the ground, as out of a second or third-storey window, or exposed on hills or rising ground, will be found to be higher than the readings made where the thermometers are near the ground, or in valley bottoms. The occurrence of rain and snow at *any* time of day in winter, while in summer our precipitation comes chiefly in the afternoon and evening, from thunderstorms, will soon be noted, both on examining the record, and as a result of individual observation.

These, and very many other facts, may and will be discovered by children who are taught along the lines which have here been indicated. Such work cannot fail to attract both teacher and scholars. It adds to the interest of life; it gives admirable training in simple scientific investigation and habits of thought; it results in making the children more careful, more punctual, and neater in their other work; and it lays a foundation on which, in after years, a more advanced study of meteorology may be built up.

Systematic work on the practical use of the daily weather maps, as outlined in the Report of the Committee of Ten on Secondary School Studies, should follow the simpler elementary exercises suggested in this pamphlet; and it is hoped to indicate, in a later publication, the lines along which this more advanced study should proceed.

ROBERT DE C. WARD.

Harvard University, Cambridge, Mass., March 14th, 1896.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1896.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	78·9	29	36·1	4	67·2	45·2	43·4	66	122·9	25·6	·14	3	4·4
Malta	77·5	22	52·3	14	69·7	57·0	55·2	78	129·7	44·8	1·02	7	6·1
Mauritius	79·3	18	62·2	22	77·0	69·1	65·4	79	128·3	53·0	13·55	17	6·4
Calcutta	99·3	23	70·4	8	94·5	77·6	75·2	71	156·0	68·9	4·35	6	4·4
Bombay	93·3	31	79·3	29	91·5	82·1	76·8	73	142·3	72·3	·26	2	2·9
Ceylon, Colombo	92·2	9	70·1	4	89·0	79·1	74·7	78	160·0	63·0	9·31	15	5·9
Melbourne	72·1	1	38·5	8	59·9	47·0	54·0	77	119·9	28·8	2·62	10	6·8
Adelaide	73·7	2	41·5	25	64·5	48·5	46·7	70	130·8	32·1	1·47	14	5·4
Sydney	81·6	3	45·2	13	65·5	52·6	49·8	86	129·7	37·9	3·84	15	4·2
Wellington	65·0	14	38·0	20*b*	59·1	47·1	45·0	74	118·0	24·0	3·03	14	4·3
Auckland	69·0	4	43·0	11	62·5	51·7	48·2	72	106·8	38·0	3·63	18	6·0
Jamaica, Kingston	90·7	15	70·0	1, 3	86·6	72·4	69·9	78	...	...	4·34	9	5·7
Trinidad	94·0	19*a*	69·0	11*c*	91·1	72·0	72·1	76	171·0	67·0	1·62	8	...
Grenada	84·6	3	71·0	16*d*	82·7	74·0	71·6	79	150·2	...	10·16	21	5·1
Toronto	90·8	9	36·5	20	71·1	49·2	48·2	66	105·0	29·0	2·44	10	5·0
New Brunswick, Fredericton	80·9	10	26·0	1	64·7	37·4	37·5	56	...	...	·88	5	4·0
Manitoba, Winnipeg	85·0	6	32·0	2	65·7	44·5	...	...	...	...	5·32	17	7·0
British Columbia, Esquimalt	65·2	29	35·3	15	58·6	43·4	43·6	84	...	...	1·62	18	7·0

a—and 20. *b*—and 21. *c*—and 19. *d*—and 23.

Remarks.

Malta.—Adopted mean temp. 62°·1, or 2°·2 below the average. Mean hourly velocity of wind 10·8 miles. Average temp of sea 63°·2. TS on 12th, L on 23rd. Absolute max. and average max. in shade the lowest for May in 13 years. Number of rainy days and the mean amount of cloud the highest recorded for May. J. F. Dobson.

Mauritius.—Mean temp. of air 0°·1 below, of dew point 1°·0 above, and rainfall 9·11 in. above, their respective averages. Mean hourly velocity of wind 11·3 miles or 1·2 mile above the average; extremes, 25·4 on 7th, and 2·1 on 20th; prevailing direction, E.S.E. T and L on 7th, and L on 18th. C. Meldrum, F.R.S.

Ceylon, Colombo.—Thunderstorms occurred on 7 days. D. G. Mantell.

Adelaide.—Mean temp. 1°·1 below the average of 39 years. Rainfall 1·42 in. below the average. C. Todd, F.R.S.

Sydney.—Rainfall 1·24 in. below, and humidity 10·8 above, their respective averages. H. C. Russell, F.R.S.

Wellington.—Fine up to the 4th, then showery to 7th, heavy R on 8th and 14th, but otherwise generally fine for the remainder of the month, with only light rain at times. Prevailing winds N.W., strong on four days; fog on 14th. Temperature 1°·1 above, and rainfall 1·96 in. below, their respective averages. R. B. Gore.

Auckland.—A showery month, but with no heavy falls of R. Violent N.E. gale on 13th and 14th. Mean temp. almost exactly the average, rainfall slightly below. T. F. Cheeseman.

Jamaica, Kingston.—Mean hourly velocity of wind 3·4 miles. Rainfall in Kingston one-fifth less than the average, but the mean for the Island shows a fall of about the average. R. Johnstone.

Trinidad.—Rainfall 2·03 in. below the average of 30 years. J. H. Hart.

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SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall.	4·17	XI.	Lake Vyrnwy	6·09
,,	Birchington, Thor	5·32	,,	Corwen, Rhug	5·59
,,	Hailsham	5·75	,,	Criccith, Talarvor.....	4·98
,,	Ryde, Thornbrough	4·20	,,	I. of Man, Douglas	5·50
,,	Emsworth, Redlands ...	3·19	XII.	Stoneykirk, Ardwell Ho.	2·15
,,	Alton, Ashdell	3·79	,,	New Galloway, Glenlee	3·70
III.	Oxford, Magdalen Col..	2·66	,,	Lilliesleaf, Riddell	4·27
,,	Banbury, Bloxham	...	XIII.	N. Esk Res. [Penicuick]	6·00
,,	Northampton, Sedgebrook	3·70	,,	Edinburgh, Blacket Pl..	4·14
,,	Alconbury	3·26	XIV.	Glasgow, Queen's Park..	3·70
,,	Wisbech, Bank House...	4·02	XV.	Inverary, Newtown	4·96
IV.	Southend	3·19	,,	Oban, The Corran	3·13
,,	Harlow, Sheering..... ...	3·46	,,	Islay, Gruinart Schools..	2·24
,,	Colchester, Lexden	2·64	XVI.	Dollar.....	4·10
,,	Rendlesham Hall	2·83	,,	Balquhidder, Stronvar...	7·18
,,	Rusball Vicarage	2·69	,,	Ballinluig	1·93
,,	Swaffham	4·42	,,	Dalnaspidal H.R.S.....	7·61
V.	Salisbury, Alderbury ...	3·10	XVII.	Keith H.R.S.....	7·00
,,	Bishop's Cannings	2·94	,,	Forres H.R.S.	2·92
,,	Blandford, Whatcombe.	3·55	XVIII.	Fearn, Lower Pitkerrie..	1·90
,,	Ashburton, Holne Vic...	5·48	,,	N. Uist, Loch Maddy ...	4·09
,,	Okehampton, Oaklands.	5·13	,,	Invergarry.....	6·81
,,	Hartland Abbey	4·94	,,	Aviemore H.R.S.	5·12
,,	Lynmouth, Glenthorne.	6·19	,,	Loch Ness, Drumnadrochit	8·42
,,	Probus, Lamellyn	5·17	XIX.	Invershin	2·93
,,	Wellington, The Avenue	3·12	,,	Scourie	6·11
,,	Wincanton, Stowell Rec.	...	,,	Watten H.R.S.....	3·40
VI.	Clifton, Pembroke Road	5·04	XX.	Dunmanway, Coolkelure	4·59
,,	Ross, The Graig	2·85	,,	Cork, Wellesley Terrace	3·12
,,	Wem, Clive Vicarage ...	2·93	,,	Killarney, Woodlawn ...	4·19
,,	Cheadle, The Heath Ho.	3·13	,,	Caher, Duneske	2·45
,,	Worcester, Diglis Lock	1·56	,,	Ballingarry, Hazelfort...	2·82
,,	Coventry, Coundon	2·86	,,	Limerick, Kilcornan ...	2·65
VII.	Ketton Hall [Stamford]	...	,,	Broadford, Hurdlestown	2·48
,,	Grantham, Stainby	3·82	,,	Miltown Malbay	3·67
,,	Horncastle, Bucknall ...	3·69	XXI.	Gorey, Courtown House	3·29
,,	Worksop, Hodsck Priory	3·68	,,	Athlone, Twyford	2·39
VIII.	Neston, Hinderton	4·05	,,	Mullingar, Belvedere ...	2·90
,,	Southport, Hesketh Park	4·92	,,	Longford, Currygrane...	2·59
,,	Broughton-in-Furness ...	6·46	XXII.	Woodlawn	3·37
IX.	Ripon, Mickley.....	4·12	,,	Crossmolina, Enniscoe ..	9·45
,,	Melmerby, Baldersby ...	3·78	,,	Collooney, Markree Obs.	4·90
,,	Scarborough, Obs.	4·58	,,	Ballinamore, Lawderdale	3·69
,,	Middleton, Mickleton ...	3·59	XXIII.	Lough Sheelin, Arley...	2·10
X.	Haltwhistle, Unthank...	4·71	,,	Warrenpoint.....	2·00
,,	Bamburgh	6·18	,,	Seaforde..	2·21
,,	Keswick, The Bank.....	8·29	,,	Belfast, Springfield	3·58
XI.	Llanfrechfa Grange	5·23	,,	Bushmills, Dunlarave..	4·47
,,	Llandovery	5·50	,,	Stewartstown	2·67
,,	Castle Malgwyn	6·31	,,	Killybegs	8·57
,,	Builth, Abergwesyn Vic.	8·01	,,	Lough Swilly, Carrablagh	5·76
,,	Rhayader, Nantgwillt...	6·97			

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OCTOBER, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	
			inches.	inches.	in.							
I.	ENGLAND.	London (Camden Square) ...	3·05	+ ·16	·67	12	18	62·9	8, 9	29·2	28	
II.		Maidstone (Hunton Court)...	4·51	+ 1·05	·54	13	20	...	...	...	...	
,,		Strathfieldsaye	3·25	...	1·09	6	22	...	...	...	...	
III.		Hitchin	3·36	+ ·29	·41	15	21	62·0	3	28·0	27	
,,		Winslow (Addington)	3·38	+ ·29	·59	25	23	63·0	3	28·0	27	
IV.		Bury St. Edmunds (Westley)	3·24	— ·03	·52	12	16	62·0	3	30·0	30	
,,		Norwich (Brundall)	3·38	...	·40	12	24	64·4	3	29·0	30	
V.		Weymouth (Langton Herring)	2·47	— 1·07	·80	6	19	63·0	3	32·0	31	
,,		Torquay (Cary Green)	3·99	...	·86	6	21	65·6	3	33·6	23*a*	
,,		Polapit Tamar [Launceston]..	5·21	+ ·28	·80	5	25	64·9	3	26·1	23	
VI.		Stroud (Upfield)	3·72	+ ·69	·75	25	21	65·0	3	29·0	21*b*	
,,		Church Stretton (Woolstaston)	3·84	+ ·07	·60	16	23	63·5	2	30·0	29	
,,		Tenbury (Orleton)	2·24	— ·97	·39	16	20	65·0	3	24·7	21	
VII.		Leicester (Barkby)	3·08	— ·07	·50	16	25	63·0	3	23·0	30	
,,		Boston	3·88	+ ·77	·75	16	20	65·0	16	30·0	23	
,,		Hesley Hall [Tickhill].....	3·23	+ ·13	·75	18	24	64·0	2	27·0	27	
VIII.		Manchester (Plymouth Grove)	4·34	+ ·97	·85	6	22	66·0	2	26·0	28	
IX.		Wetherby (Ribston Hall) ...	2·70	— ·43	·55	6	19	...	...	...	...	
,,		Skipton (Arncliffe)	6·08	+ ·05	·86	5	24	...	...	...	...	
,,		Hull (Pearson Park).	6·01	+ 2·36	1·02	18	26	62·0	8	27·0	27	
X.		Newcastle (Town Moor)	5·68	+ 2·56	1·03	10	25	...	...	...	...	
,,		Borrowdale (Seathwaite).....	13·02	+ 2·43	2·65	7	22	...	...	...	...	
XI.	WALES.	Cardiff (Ely).....	4·77	+ ·23	·83	24	19	...	...	...	...	
,,		Haverfordwest	6·89	+ 1·74	1·15	9	23	62·1	3	27·9	29	5
,,		Aberystwith (Gogerddan) ...	4·79	— ·56	·60	6	20	62·0	2	...	...	
,,		Llandudno.....	4·20	+ ·81	·81	7	21	64·5	2	32·5	29	0
XII.	SCOTLAND.	Cargen [Dumfries]	4·19	+ ·93	1·76	7	12	60·8	2	23·0	28	12
,,		Jedburgh (Sunnyside).....	5·85	+ 3·20	1·76	11	17	61·0	2	25·0	23	7
XIV.		Colmonell	3·51	...	·90	7	15	67·0	2	21·0	22	11
XV.		Lochgilphead (Kilmory)	4·80	+ ·01	·84	23	17	...	...	23·0	22	18
,,		Mull (Quinish).....	4·58	— ·71	1·19	8	17	...	...	...	...	
XVI.		Loch Leven Sluices	3·90	+ ·94	1·00	8	11	...	...	...	...	
,,		Dundee (Eastern Necropolis)	2·90	+ ·66	·90	7	17	63·3	2	25·5	25	9
XVII.		Braemar	5·68	+ 2·07	1·20	18	21	62·7	1	17·0	25	16
,,		Aberdeen (Cranford)	4·53	...	1·10	18	23	65·0	1, 2	26·0	24*c*	9
,,		Cawdor (Budgate)	5·01	+ 2·28	1·00	9	19	...	...	...	...	
XVIII		Strathconan [Beauly]	7·01	+ 2·36	1·08	19	14	...	...	...	...	
,,		Glencarron Lodge.....	7·32	...	1·42	9	24	55·7	1	23·0	25	14
XIX.		Dunrobin	3·07	— ·24	·50	7	21	61·0	1	30·0	10*c*	5
,,		S. Ronaldsay (Roeberry).....	5·25	+ 1·52	1·01	5	23	56·0	1	30·0	10	3
XX.	IRELAND.	Darrynane Abbey.....	5·72	...	·79	1	23	...	...	...	...	
,,		Waterford (Brook Lodge) ...	2·79	— 1·03	1·12	7	16	68·0	1	27·0	28	6
,,		O'Briensbridge (Ross)	3·19	...	·44	24	19	...	...	...	...	
XXI.		Carlow (Browne's Hill)	3·90	+ ·61	1·17	7	18	...	...	...	...	
,,		Dublin (Fitz William Square)	2·51	— ·87	·77	7	22	63·7	2	30·1	23	2
XXII.		Ballinasloe	...	...	...	...	...	...	...	...	...	
,,		Clifden (Kylemore)	8·63	...	1·40	7	26	...	...	...	...	
XXIII		Waringstown	2·76	+ ·05	·49	7	21	60·0	1	26·0	18*d*	11
,,		Londonderry (Creggan Res.).	4·96	+ 1·29	·87	7	30	...	...	...	...	
,,		Omagh (Edenfel)	4·36	+ 1·26	·57	7	25	59·0	1	27·0	27	5

+Shows that the fall was above the average ; —that it was below it.

a—and 29. *b*—and 27. *c*—and 25. *d*—and 28.

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METEOROLOGICAL NOTES ON OCTOBER, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

ADDINGTON.—A wet month, with very few really fine days, and a large flood on the 16th and 17th. Dense fog on 28th and 29th. Frequent slight frosts from the 20th to the end; many tender plants cut off on the 23rd, and all killed on the 28th. Autumn tints very beautiful.

BURY ST. EDMUNDS, WESTLEY.—R nearly every day till the 21st. Very little frost, but a cold month, the temp. reaching 62° on only one day. T S S on 5th, 10th and 14th; T on 25th.

NORWICH, BRUNDALL.—Much depressing, damp weather, with frequent rains, though at no time excessively heavy. The frequency of the rain made it appear wetter than many months which have had a much larger total fall. Severe T S on the morning of the 14th, quite overhead at 7 a.m. Stormy with H and L on 5th; S.W. gale on 8th; stormy with T and L on 25th.

WEYMOUTH, LANGTON HERRING.—The first ten days of the month were mild, with a good deal of wet; the weather became much colder on the 11th, on which day the temp. was 10° lower than on the 10th; and with the exception of the 15th and 16th, it continued cold to the end. On 16 days the min. temp. was below 40°, and on 14 days the max. was below 50°. The mean 9 a.m. temp.—46°·5—is 3°·5 below the average. Solar halo on 1st; T and L on 18th.

TORQUAY, CARY GREEN.—Rainfall ·33 in. below the average, the fall for the 10 months January to October being 8·75 in. below the average. Mean. temp. 47°·8, or 3°·5 below average. Duration of sunshine, 120 hours, being 4 hours above the average; 5 sunless days.

POLAPIT TAMAR [LAUNCESTON].—Very wet throughout, but the total fall for the first ten months of the year is 4·14 in. less than the average. The first ten days were generally rough and stormy, and the last fortnight, though calm, was very cold. H on 4th, 5th, 18th, 25th and 27th; S.W. gales on 6th, 7th, 8th and 25th. S on 11th.

STROUD, UPFIELD.—Severe S.W. gales on 6th and 7th. S storm on 25th.

WOOLSTASTON.—A cold, wet month. Mean temp. 43°·5. S on 10th and 24th.

LEICESTER, BARKBY.—A cold, wet month, with considerable fog and some sleet and flakes of S. Last swallow seen on 18th. Mean temp. 44°·1.

MANCHESTER, PLYMOUTH GROVE.—The coldest October since observations commenced in 1868. H storm, T and L on 10th. S and sleet on 11th. Thick fog on 19th, 20th, 22nd and 31st. Dense fog on 27th. Mean temp. 43°·5.

NEWCASTLE.—The heaviest month's R at this station since August, 1890, when the total fall was 6·22 in.

SEATHWAITE.—S on 11th, 1½ in. deep at 9 a.m., on 22nd 1 in. deep, and on the 25th 2 in. deep. Six falls of R of exceeding an inch in 24 hours.

WALES.

HAVERFORDWEST.—The most stormy October since 1886, and unprecedented damage was done on this coast. On the 8th a great tempest arose from S.S.E. with heavy R, and this, together with a very high spring tide, caused the

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waters to rise to such a height that houses were flooded, and on the exposed beach at Newgate the ocean broke in, overwhelming the lofty pebble barrier and sweeping away a lonely house on the shore. A heavy fall of S on 11th, and S on the mountains on 26th. L and T on 7th, 25th and 29th; L on 9th, 11th and 18th.

ABERYSTWITH, GOGERDDAN.—Very stormy and cold throughout the month. S on the 25th.

SCOTLAND.

CARGEN [DUMFRIES].—Another dreary, sunless month. The mean temp.—43°·4—is nearly 4° below the average of 37 years, and was lower only in 1892—43°·1. A deep depression crossed on the 8th, accompanied by a severe S.W. gale; one of the highest spring tides of the year occurred concurrently, and an exceptionally heavy rainfall having taken place during the previous night, the Nith was in heavy flood, overflowed its embankments, and a large tract of arable land was submerged, and much damage done. 1·76 in. of R fell on the 7th, and on only six occasions has more fallen in 24 hours since observations commenced. The total R for the 10 months of the year is 2·63 in. below the average. With the exception of the gale on 8th, and stiff breezes on 5th and 11th, light winds, generally E., prevailed. Sunshine again much deficient. S covered the district on the 25th.

JEDBURGH.—The weather was most ungenial during the month, N. and N.E. winds prevailing, with very little sunshine and low temperature, excepting about six days. Country work has gone on well. The rainfall of the month has never been so heavy during 32 years.

BRAEMAR.—A very unsettled, cold month.

ABERDEEN, CRANFORD.—The month has been cold and wet, with little sunshine and N. or N.E. wind after the 10th.

S. RONALDSAY, ROEBERRY.—A very cold, wet and windy month. N. or N.E. wind on 16 days. Mean temp. 42°·6, being 3°·9 below the average of six years.

IRELAND.

DARRYNANE ABBEY.—A cold, wild month. The very high tide and strong gale on the night of the 7th-8th broke over the embankment, and flooded the rain gauge. [Amount originally estimated has been confirmed by comparison with two other records.—ED.].

WATERFORD, BROOK LODGE.—H on 4th. Heavy gale from S.W. to S.E. on 8th. S from 7 to 11 a.m. on 11th. L on 12th and 27th. Lunar halo on 20th.

DUBLIN.—As in 1892 and 1895, so is 1896 October proved a very cold month. It was also inclement in the matter of wind and R. Had it not been for a few warm days at the beginning, the mean temp. would have been the lowest on record in recent years. Mean temp. 45°·0, or 4°·7 below the average. TSS on the evening of the 29th; L on night of 21st. High winds on 11 days, attaining the force of a gale on the 8th. Foggy on 4 days; H on 3 days; sleet on 3 days. A lunar halo on the 18th; solar halos on 7th, 10th and 23rd; aurora borealis on the evening of the 11th.

WARINGSTOWN.—Nights unusually cold. S on 28th.

OMAGH, EDENFEL.—The weather of October has been of the same stormy, wet and unsettled character that has prevailed since the 17th August, between which date and the 13th October but five days occurred without rain, mostly heavy; but this cessation was of short duration, as from the 17th to the end was equally unpropitious, and the damage to all crops has been irreparable.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXI.] DECEMBER, 1896. [PRICE FOURPENCE, or 5s. per ann. post free.

WEATHER IN THE LAST CENTURY. 1713—1745.

EARLY records of the weather being somewhat rare, the following notes are, we think, worthy not merely of preservation, but of publication. They were kindly furnished to us by Mr. Basil Woodd Smith, of Hampstead, and are derived from a register kept at Richmond, Surrey, by Mr. George Smith, a Proctor to Queen Anne. The register contains a record of daily observations (made without instruments) from April, 1713, to June, 1745. Mr. Smith died, aged 70, in July of that year, and was buried in Richmond Churchyard, where his tombstone is to be found. A transcript of the register was given some time ago to the Royal Meteorological Society and placed in its library.

We give chiefly the summaries made by the observer, and a few of his occasional notes.

It is to be observed that—

1. The recorder is a good deal given to the use of superlatives.
2. He uses the word "season" sometimes to express a very limited space of time, and at others in its usual more extended sense.
3. In his summaries at the end of December it is not always clear whether "winter" refers to the previous winter or to the actual one. In some cases the note seems to have been filled in later.
4. The dates are those of the Old Style, requiring the addition of eleven days to bring them into correspondence with dates since September 2nd, 1752, when the New Style came into use.

A propos of the frequent reference to figs, a family tradition relates that Mr. Smith was in the habit of sending a basket of figs to Queen Anne every year. On one occasion he omitted his customary present, and on the Queen saying, "Proctor, how is it you have sent me no figs this year?" he replied: "Please your Majesty, the basket was not returned."

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1712—13. Unsettled year. Jany. to May chiefly cold. "Dull, wet summer." June 23, 24 "very hott"; 25, 26 "cold as Xmas." July warmer, but (30) "generally a very wet season since S. Swithin, no fruit"; Aug. 31. "Good harvest weather all this moon, but the first fortnight extream fine." Nov. 8. "Small rain froze or it fell, extream slippery." December warmer. (18) "A great storm, thunder, lightning, hail and rain from N.W."

1713—14. Jan. 25. "The dryest time that ever I knew, and the finest weather; like Aprill." 31. "Mighty fine." Feb. 11–14. "Dusty as May. Warm enough." 16. "The largest snow I ever saw." 19. "The Highest Tyde ever known." April 5. Very hard frost killed fruit." May 6. "Very hard frost, rain all day from N.E." June 21–27. "Extream hott and clear and dry. Wind E most part." July 25–31. "Extream good harvest weather; corn all in by end of month." Aug. 1. "Qu: Anne dyed at ½ after 7 morn." Sep. 18. "King George landed at Greenwich at 6 even." 20. "K George entred thro London." Summer generally fine. Dec. 13. "Hard frost as ever known; in one night much ice in Thames."

1714—15. April 22. "Totall Eclipse of the Sun, very dark; Starrs to be seen." June 30. "Extr: wet season, damaged hay and corn." Year appears to have been generally warm, but no further special remark called for by weather till Nov. 11, "hard frost." 20. "Very thick stincking fog all day." Frost lasted off and on till Dec. 27, "Ice fixed" in river. 29. "Thames passed; people went over."

1715—16. Jan. 7. "Ground like glass." 9. "hardest frost of all." 19. "Great snow in night." 26. "Ice broke at 3 morn." March 5. "Extraordinary appearance in the air, light and fire and dark clouds." (Dr. Halley did not see this, but describes the aurora of Nov. 6, 1719, which is not noticed by our observer, as the first he had seen.) Summer mostly dull. Sept., frequent high winds. 13. "Great storm all night; great harm."

1716-17. March 30. "Streaks of light in the sky from N." Weather mostly warm and cloudy in first months of year. Some hot days in June. 16. "Thunder and very great lightning." Summer mostly hot. Nov. 23. "Very terrible night for wind and rain, thunder and lightning." Dec. 14. "Morn. highest Tyde ever known, tho the moon in the last quarter; occasioned probably by a great Storm all night at N.W. Overflowed Westminster and keys at Custome house. Extr. great Damage in Holland."

1717—18. Observer's summary. Dec. 31. "The Sumer was very hott and dry; extr. good grapes; very little other good fruit; 2nd crops white figs ripe; harvest very forward, all got in begin. Sept. Extr. mild winter."

1718—19. March 19. "About 8 ev. extr. ball of fire in the sky, light as sun." Aprill "Extr. dry season." Dec. 31. "This Summer was very hott and dry; good grapes, no other fruit. The

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second crop of figs ripe at Michaelmas; very mild dry winter, water very low."

1719—20. Dec. 31. "All Xmas warm as April, trees ready to blossom. The Summer wet and green; with little good fruit. Grapes late ripe, but some good. Winter warm and wet, no frost, mildest season ever known."

1720—21. No summary. Jan. and Feb. cold. Summer apparently cloudy and dull. Autumn variable.

1721—22. "Wet Sumer; fair fine Autumn; very good grapes; fine fair mild dry winter."

1722—23. May 31. "Extror. dry Season as ever known." June 28 and Sep. 30 similar entries. Dec. 31. "Longest Sumer ever known, very dry; good grapes; 2 crop of figs, some blew (? purple) ripe. Dry warm winter. 3 weeks at Xmas fine weather as April."

1723—24. April 30. "A very kindly fine April." May 11. "Sun eclipsed almost total dark, but not plain to be seen by reason of dark clouds." June 9. "Extream hot. Aftn. great storm, rain, great hail thunder and very high wind N., perfect hurricane and Spout, Even very hot." Dec. 31. "Very long Sumer, good grapes. 2nd crop figs ripe in Sep., great plenty all sorts of fruits, especially apples and pears, tho' no good pears. Fine winter, dry till lately."

1724—25. Feb. 28. "Extr. dry time. Fine weather." June 30. "The wettest and coldest season ever known in Sumer; fires kept every night till 28 June." July 31. "This whole month more like Winter than Sumer." Dec. 31. "Extraordinary unkindly Sumer. Constant Rains and Cold; no good fruit, rotten before ripe; no grapes at all; figs rotted on the trees. Winter warm and wet; very little frost, no snow."

1725—26. Sept. 30. "A great Landwater for 10 daies." Nov. 30. "Finest November ever known." Dec. 31. "Very kindly year; long Sumer; few grapes on vines, those extraordinary good; good fruit all sorts. 2nd crop figs ripe, wet winter, great land waters, and very hard frost, and great snows before Xmas."

1726—27. Feb. 28. "A very great landwater as known these many years. Springs extr. high, wet season." Nov. 30. "Waters very low." Dec. 31. "Kindly year; vast quantity of grapes and very good. 2nd figs ripe in Sept., no apples or pears. Dry winter, waters very low, a deal of foggy weather and some very hard frost and great snow before Xmas."

1727—28. No summary. Weather not very marked.

1728—29. Feb. 28. "This has been the longest coldest season ever known, the spring is now as backward as in December. Dec. 31. "Very wet and warm winter, no frost or snow."

1729—30. April 30. "Very dry burning weather." July 3. "Spout of rain and wind; extr. great shower." Oct. 31. "Very dirty season as ever known; warm." No general summary of year.

1730—31. May 31. "Exceeding dry Season, no grass." Dec. 18.

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"Fair and fine, cold." 27. "Extream cold, hardest frost ever known in one night with snow." 29. "Snow all gone, warm, fine." 31. "Mild. Short winter, very dry time. Thames as low and dry as in Sumer."

1731—32. July 31. "Very dry, good harvest." Aug. 31. "Very dry season." Sep. 30. "Very dry season." Dec. 31. "The year ends with warm moist dirty weather."

1732—33. No summary. Apparently cool summer. Dec. 31. "Cloudy warm dirty weather, S. and S.W. with some storms ends the year."

1733—34. Dec. 31. "An extra. wet season, land floods very high, and lasted till the middle of January." No general summary.

1734—35. Feb. 28. "A very wet dirty time; land floods." Dec. 31. "Wet warm dirty season. Very wet unkind year. No grapes. Good plumbs and apples."

1735—36. Feb. 16 "Greatest tyde ever known; much damage in cellars and warehouses. Marshes overflowed, cattle drowned." 29. "Extream cold all the month." July 31. "An extream hot time." Aug. 31. "Extr. fine weather." Oct. 31. "A very warm, dirty, hazey month." Dec. 31. "A very mild winter, wet summer, little good fruit.

1736—37. April 30. "Dry and dusty." May 31. "Very hot dry time." June 30. "Very dry season." July 31. "Cool season." Aug. 31. "Cold wet season." Sep. 30. "Warm and wet season." Dec. 31. "Mild winter, unkindly wet summer, no good fruit."

1737—38. Jan. 31. "The finest season for the time ever known." April 30. "Very cold unkindly season; nothing grows." Aug. 31. "A very wet unkindly cold season, no good fruit." Sep. 30. "A very wet time as ever known. Extr. heavy showers, little thunder." Nov. 30. "The most kindly month in the whole year."

1738—39. April 30. "A very unkind season till the 25. Since, fine growing weather. All fruit killed." June 30. "Very fine hay harvest." Sep. 30. "All the month wet, dark, warm, too close; a very bad season for fruit and corn." Oct. 30. "This month pretty good weather, but cold." Dec. 30. "Thames froze over in 4 daies. Storm of wind 48 hours."

1739—40. Jan. 1. "Some people walked over the Thames." (Frost continued till Feb. 1, when thaw began in day, frost returning each night.) Feb. 11. "Ice all gone in Thames upward but not broke abt. London." 13. "Ice begins to run in Thames." 17. "Ice broke in Thames." 23. "Ice gone at London." 29. "This was the severest frost I ever knew, and the most kindly thaw. No rain, roads good, all garden stuff destroyed." Hard frost again in March. 31. "A very backward spring, dry and dusty as summer; no considerable rain 3 months past; the river as low as ever known." April 21. "Very great storm snow and wind from 10 to 2." 30. "A very cold unkind season." May 31. "Extr. dry dusty and cold, very unpleasant season." July 31. "A very dry time, pleasant

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weather." Aug. 31. "Fine harvest weather, great dews." Sep. 30. "The coldest weather ever known at Michs. Piercing cold." Dec. 31. "A very unkind year; no good fruit, nor warm weather; winter severe; storms and frost with great snow."

1740—41. March 30. "A very terrible unkind season." Apl. 30. "A very dry cold season." June 30. "Glorious hay harvest." July 31. "Fine harvest as ever known; dry, dusty, no grass." Aug. 31. The finest harvest weather ever known; hot and dry; no grass, good fruit, harvest in by 20 August." Sep. 30. "The finest season ever known; warm and kindly." Oct. 31. "Fine season as ever known." Nov. 30. "Very mild kindly season, warm and fine." Dec. 13. "Clear very hard frost, great rime not melted by the sun tho' shone all day; trees white as snow." Dec. 31. "A very kindly year; sumer very hot and dusty; very good fruit, plumbs and grapes: Winter mild and fine till Xtmas, and then hard frost; ice in Thames."

1741—42. March 31. "An extr. cold dry time as ever known; no rain all this month; dusty as Midsummer." April 30. "Extr. dry and dusty time." June 30. "Seasonable showers after a very dry long season." Aug. 31. "An extraordinary dry season, fine harvest but no grass, nor good fruit; great plenty of corn. No rain for five weeks, hot burning sun." Sep. 30. "Very cold dry unkindly season, no grass; grapes not ripen." Oct. 31. "Very kindly seasonable weather all this month with high winds." Dec. 13. "Hardest frost, much ice in Thames, boates not able to go."

1742—43. Jan. 27. "In night great tyde." Feb. 20. "Very fine season." 28. "An extraordinary pleasant month." March 31. "A cold unkindly season, tho' some fine raines." Frost and snow first few days of April. April 30. "The beginning of this month cold and dry and dusty; the end extr. seasonable, fine raines." July 31. "Very fine kindly harvest and great plenty." Aug. 31. "Dry dusty time." Nov. 30. "Very fine weather latter end of the month." Dec. 31. "Hardest frost, clear, ice runs in river."

1743—44. Jan. 6. "Thames clear of ice." Feb. 1. "Comet appears plain and bright all evening till past eight." 18, 19, 24, 25, 28. Storms of wind. 29. "A very stormy season." May 31. "Very hot dry and dusty time." June 20. Similar entry. July 31. "Good harvest weather." Aug. 31. "A very stormy season." Sep. 10. "Great storm of wind, lasted 24 hours; all fruit blown down." Sep. 30. "A warm wet season. No grapes. Plumbs and pears extra good." Oct. 29. "Great landwater." Dec. 31. "Extr. fine weather ends the year."

1744—45 No special character. Diary ends June 3, 1745. Mr. Smith died July 26.

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THE SCIENTIFIC USE OF KITES.

To the Editor of the Meteorological Magazine.

SIR,—I appreciate very highly your kindly words relative to the use of the kite for scientific purposes, and, therefore, hasten to reply to the query on page 148 of your magazine for November, where you say "a kite can go up only when there is wind, a balloon can go up in a calm; a kite cannot carry as much weight as a balloon. Why are kites better than captive balloons?" I reply, because the captive balloon has a narrow field of usefulness, whereas the kite has a wider field and is more efficient therein when the wind is blowing. May I call your attention to the fact that, in the greater portion of the United States, there are many days when it is too cold to manage a balloon on account of the stiffness of the cordage, and the material of which the bag is made. There are also many other days on which the wind and upper currents are entirely too strong to allow of operating a captive balloon at all. There are many days of rain or snow when the balloon is laden by these so heavily that it will not rise to advantage. In general, the captive balloon rises but a 1,000 ft., whereas a kite may go up to 10,000. Probably, you have the same difficulties occasionally in Europe. At many of our stations the captive balloon would be useless half the time, and, except in perfect calms, far less efficient than a kite. Hitherto we have not found the rain, the wind, or the cold to interfere seriously with kites. There are, of course, many hours when the wind is too light for a heavily laden kite to start, but in such cases a lighter kite or balloon may be used to assist. The advantages of the kite over the free balloon are manifold, the most important items are: (1) You are sure of having the thermometers well ventilated; (2) You have no need of travelling 500 miles to get your records back again; (3) Relatively slight expense of money and time. The advantages over captive balloons are especially manifest in windy weather, when the wind causes the balloon to oscillate violently within a few hundred feet of the ground, while the cord that holds it captive is inclined at an angle of ten degrees, whereas the same wind elevates the kite to an angle of fifty or sixty degrees, and to a height of five or ten thousand feet, where it floats with a steadiness that is beautiful to behold. The self-registering apparatus may be made of various weights, from one pound up to fifty, and our kites will carry these up as easily as will a balloon. If either kite or balloon breaks loose, the balloon is liable to be carried away much farther than a kite, therefore, more liable to be lost entirely. Our biggest kites that broke away at a height of 7000 ft. during a violent local storm, were recovered unharmed after they had descended to the ground fifteen miles away.

We are confident that there is an important field of usefulness for the kite, and we hope to develop this without neglecting the balloon.

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Will not our European Colleagues join in the work?

With highest regard, I remain,

Yours truly,

WILLIS L. MOORE,

Chief of Bureau.

U.S. Department of Agriculture, Weather Bureau, Washington, D.C., November 30th, 1896.

[Prof. Moore has made out a very strong case for kites, and as he says that the balloon shall not be neglected, we think that the matter may be left where it is.

As regards European co-operation, although we have not heard of anything being done in England, we believe that much is being attempted on the Continent.—ED.]

REVIEWS.

Elementary Meteorology for High Schools and Colleges, by FRANK WALDO, Ph.D., late Junior Professor, U.S. Signal Service, Member of the Austrian and German Meteorological Societies, &c. American Book Company, New York, Cincinnati and Chicago [1896]. Sm. 8vo, 373 pages, 121 maps and engravings.

YET another American work on Meteorology, and one for schools! Surely with all this teaching there ought to be amply sufficient readers to support an American Meteorological Magazine.

We do not know how to reconcile the rapid succession of works by Waldo (1893), Davis (1894), Russell (1895), and now a fresh one by Waldo (1896), with the death from inanition of our excellent friend the *American Meteorological Journal*.

However we are not called upon to solve that problem, but to express our opinion of the new arrival. We like it very much, and think that many whose school and college days are only memories in the far past, would enjoy this book—the like of which assuredly they never had either at school or at college.

It seems to us that Dr. Waldo has rarely forgotten for whom he was writing, and while not allowing any wrong statement to appear, has checked himself when tempted to run off into elaborate formulæ or detail—thus producing a well balanced work which, as far as we have noted, few could read without pleasure and profit.

On page 104 Dr. Waldo has made a slight slip—purely accidental. The words used might lead a youth to suppose that Robinson's cups are the only pattern of anemometer!

On page 172 there is a useful block representing Solar Halos and Parhelia, but good as it is, we think that the insertion of a Z or the word Zenith would improve it, and we should have added the vertical circle, through the sun, which produces the phenomenon known as a "Sun pillar." We also notice that the parhelia are represented as absolutely at the intersections of the various halos, which is rarely the case.

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There is one expression (perfectly obvious to those familiar with the subject) on p. 176 which we should alter. Speaking of the aurora borealis Dr. Waldo says :

"The auroral arch usually spans the sky in an east-westerly direction. In the middle latitudes it is seen to the north, and in extreme northern latitudes to the south."

We think that for the moment the author had forgotten the southern hemisphere, and the aurora australis, and did not realize that his expression "to the south" might be imagined to mean on the southern horizon. He doubtless meant to state that arctic travellers have reached latitudes north of the auroral belt, and therefore seen it south of the zenith, but we think that it might be expressed more clearly.

The half chapter devoted to Tornadoes is excellent, but we should have given the pressures in inches of mercury, as well as in pounds. Though a barometric depression in their centre of 7½ *inches* seems to us excessive, Dr. Waldo doubtless has Prof. Ferrel at his back, and therefore it is somewhat rash to criticize this value, but a third of it would give an expansive force of more than half a ton on each square yard of surface, and a thirtieth of it or 0·25 inch would give a lifting force of about a ton for each 13 square yards—or two tons to the ceiling of a small room 15 ft. square. Therefore, terrible as is the wreckage along the path of a tornado, we do not see the need for imagining a depression so far beyond anything ever observed. We shall probably not often have a better chance of a record of the actual depression than that of the barograph in the *Tour St. Jacques* during the small whirlwind which stripped roofs and overturned so heavy a vehicle as a Paris omnibus—its centre went within a few yards of the *Tour St. Jacques* and the barometer fell suddenly and momentarily—not 7½ inches but 0·24 inch, almost precisely what we suggested.

The whole tone of the book is good, for while the author brings in the latest discoveries (*e.g.*, Argon) we come on sentences like the following :

"The science is as yet but partially developed, and much that is at present accepted as fact will be modified by future investigations," and again, after showing that theoretically carbon dioxide ceases at about 10 miles above the earth's surface, water vapour at 12, oxygen at 30 and nitrogen at 35 miles, he states :

"Observations indicate, however, that the atmosphere extends much higher than this, which shows that our knowledge of the laws of atmospheric gases is still incomplete."

As a rule the illustrations are good, but those on pages 31, 218 and 244 are feeble, and why should metric values be used on them whereas in all the rest of the work English scales are employed? On the other hand we think that this is the first text book illustrated with engravings of snow crystals made from photographs of the crystals themselves. The book is handy, well printed and on good paper.

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The Psychrometer. 8vo, 4 pp.

This is a remarkable paper, only four pages, with no indication of author, printer, or place—but it reached us in an envelope dated at Washington, U.S.A., Oct. 22nd, 1896.

The writer is perhaps prudent in preserving his anonymity, considering how severely he criticizes not merely the Assmann Aspirator, but the Editors of the *Zeitschrift* for admitting two recent articles. The anonymous writer is evidently one of vigour and ability, though we have an impression that even he does not know quite all that has been recently done respecting the theory of the wet bulb thermometer, but we do not at present intend to take any part in the controversy. A copy has doubtless been sent to the Editors of the *Zeitschrift*, and they will deal with it as they think best.

It is however rather amusing that at the end of September the International Congress of Meteorologists at Paris recommended the use of the Assmann Aspirator as if it were perfection, and in the early days of October this paper attacking it was being sent to the printer.

ROYAL METEOROLOGICAL SOCIETY.

THE first monthly Meeting of this Society for the present session was held on Wednesday, November the 18th, at the Institution of Civil Engineers, Great George Street, Westminster; Mr. E. Mawley, F.R.H.S., President, in the chair.

Mr. W. Ellis, F.R.S., presented his Report on the Proceedings of the International Meteorological Conference, held at Paris, from September 17th to 23rd, which he attended as the delegate from the Royal Meteorological Society.

The subjects suggested by the Society for discussion were:—

Question 6.—"The registration of bright sunshine." It was resolved that for the purposes of general climatology it is necessary that the instrument shall be so placed as to have an uninterrupted horizon. The number of hours of sunshine should be referred to the total apparent duration of the day, but with the application for each instrument of a correction relative to observations when the sun is close to the horizon.

Question 7. "The desirability of more extended observations on infiltration into the soil, and uniformity in the same." The Committee recorded that they had listened with much pleasure to the discussion to which the question had given rise, but that it appeared to be impossible, in the actual state of the question, to frame any resolution thereon.

Question 8.—"The general adoption of a standard anemometer for the determination of the velocity of the wind."

Question 9.—"The general adoption of a uniform system of exposure for anemometers." Resolved that the Sub-Committee is of opinion that it is not possible in the present state of the question, to

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recommend the use of any existing instrument as a standard, or of any mode of erection identical at all stations.

Question 12.—"Uniformity of conditions under which earth temperatures should be taken." It was recommended to continue investigations into the subject, and to prepare a report for the next Conference.

The Hon. F. A. Rollo Russell read a paper on "Haze, Fog and Visibility." From his own observations in Surrey he considers that haze is most prevalent when the wind is from the north-east, and is due probably to slight condensation of moisture by partial mixture of conflicting currents of air. The causes of fog are to a great extent the same as the causes of haze, although radiation in certain states of the air and ground plays a more conspicuous part. The main cause of fog is mixture of airs of different temperatures; and the attainment of a size of water particle so much larger than in the case of haze is due to suddenness of mixture, greater humidity, or greater differences of temperature.

The President, Admiral Maclear, and Messrs. Gaster, Marriott and Ellis took part in the discussion.

BAROMETRI DESCRIPTIO.

By Joseph Addison, 1672–1719.

We never associated "The Spectator" with meteorology, but Mr. Inwards recently called our attention to the following poem by Addison, and on the assumption that it is as novel to most of our readers as it was to us, we reprint it. Can any of our readers refer us to a good translation? If so, it might be worth while to print it.

Qua penetrat fossor terræ cæca antra, metallo
Fœcunda informi rudibusque nitentia venis;
Dum stupet occultas gazas, nummosque futuros,
Eruit argenti latices, nitidumque liquorem,
Qui nullo effusus prodit vestigia tractu,
Nec terram signo revolubilis imprimit udo,
Sed fractus sparsim in globulos formam usque rotundam
Servat, et in terretes lapsans se collegit orbes.
Incertum qua sit natura, an negligat ultra
Perficier, jubar et maturas inutile temnat;
An potius solis vis imperfecta relinquat
Argentum male coctum, divitiasque fluentes;
Quicquid erit, magno se jactat nobilis usu;
Nec Deus effulsit magis aspectabilis olim,
Cum Danaen flavo circum pretiosus amictu
Ambiit, et gratam suadente libidine formam,
Depluit irriguo liquefactum Numen in Auro.
Quin age, sume tubum fragilem, cui densior aer
Exclusus; fundo vitri subsidat in imo

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Argenti stragnun; ut pluvia impendente metallum
Mobile descendat, vel contra, ubi postulat æstas,
Prodeat hinc liquor emergens, et rursus inane
Occupet ascensu, tubulumque excurrat in omnem.
  Jam cœli faciem tempestatesque futuras
Conscia lympha monet, brumamque et frigora narrat.
Nam quoties liquor insurgit, vitreoque canali
Sublatum nequeunt ripæ cohibere priores
Tum lætos sperare dies licet, arva fatentur
Æstatem, et large diffuso lumine rident.
Sine sese immodicum attolens Argenteus humor,
Et nimium oppressus, contendat ad ardua vitri,
Jam sitiunt herbæ, jam succos flamma feraces
Excoquit, et languent consumto prata vivore.
  Cum vero tenues nebulas spiracula terræ
Fundunt, et madidi fluitant super æquora fumi
Pabula venturæ pluviæ; tum fusile pondus
Inferiora petit; nec certior Ardea cœlos
Indicat humentes, medias quando ætheris oras
Tranando, crassa fruitur sublimius aura.
Discutit et madidis rorantia nubila pennis,
Nunc guttæ agglomerant, dispersas frigora stipant
Particulas, rarusque in nimbum cogitur humor:
Prata virent, segetem fœcundis imbribus æther
Irrigat, et bibulæ radici alimenta ministrat.
Quin ubi plus æquo descendens uda metalli
Fundumămat, impatiens pluviæ, metuensque procellam,
Agricolæ caveant; non hoc impune colonus
Aspicit; ostendet mox fœta vaporibus aura
Collectas hyemes, tempestatemque sonoram.
At licet Argentum mole incumbente levatum
Subsidat, penitusque imo se condat in alveo,
Cætera quæque tument; eversis flumina risis
Expatiata ruunt, spumantibus æstuat undis
Diluvium, rapidique effusa licentia ponti.
  Nulla tacet secreta poli mirabile vitrum,
Quin varios cœli vultus et tempora prodit.
Ante refert, quando tenui velamine tutus
Incedes, quando sperabis frigidus ignem.
  Augurio hoc fretus, quanquam atri nubila cœli
Disrumpunt obscura diem, pluviasque minantur,
Machina si neget, et sudum promittat apertum,
Audax carpat iter nimbo pendente viator;
Nec metuens imbrem, poscentes Messor aristas
Prosternat; terræ jam bruma incumbit inermis,
Frigoraque haud nocitura cadunt, feriuntque paratos.

JOSEPH ADDISON.

Vol. VI., p. 427. Tickell's Addison.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1896.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	85·1	15	41·1	1	75·2	54·0	53·2	71	135·9	32·3	2·27	11	5·7
Malta	89·5	25	56·0	3	82·8	66·1	64·2	78	146·6	50·0	·00	0	3·7
Mauritius	76·6	9	58·0	26	74·6	65·0	61·2	77	124·1	49·1	1·12	13	4·9
Calcutta	93·9	9	72·7	1	89·7	77·1	76·7	83	158·7	69·4	16·12	15	7·8
Bombay	92·9	1	75·0	21	87·6	79·6	78·0	83	143·7	72·3	28·02	27	...
Ceylon, Colombo	88·2	...	73·2	5	85·8	77·3	75·3	86	151·0	70·0	8·37	18	7·5
Melbourne	62·5	10	33·2	2	56·1	42·7	43·9	80	109·0	24·2	2·58	13	6·4
Adelaide	65·3	12	37·3	20	59·2	43·4	44·2	77	125·8	28·5	3·15	19	4·9
Sydney	67·2	28	42·5	22	59·0	48·4	50·0	87	106·3	30·3	14·71	16	5·2
Wellington	66·0	17	38·5	4	55·9	45·4	44·2	80	108·0	23·0	6·00	16	5·3
Auckland	64·5	3	43·0	12	60·9	48·9	45·3	71	115·0	36·0	3·27	21	5·5
Jamaica, Kingston	91·6	16	71·8	17	89·0	75·3	69·9	70	...	...	·90	5	3·3
Trinidad	94·0	6	68·0	22	88·9	71·7	72·6	80	175·0	67·0	10·29	21	...
Grenada	84·2	7	71·0	29	82·9	74·2	72·0	82	146·2	...	8·16	21	4·0
Toronto	86·3	7	41·9	3	75·9	53·9	52·6	66	101·5	36·0	1·11	6	4·0
New Brunswick, Fredericton	84·8	20	35·0	14	72·2	46·2	48·0	62	...	...	1·92	8	4·0
Manitoba, Winnipeg	84·5	15	42·7	6	74·6	53·4	...	...	...	...	3·96	16	5·0
British Columbia, Esquimalt	86·4	26	39·3	13	65·6	48·1	48·1	81	...	...	·69	6	6·0

REMARKS.

MALTA.—Adopted mean temp. 73°·3, or 1°·8 above the average. Mean hourly velocity of wind 8·5 miles. Average temp of sea 68°·3. L on 1st and 16th. Temp. of dew point and humidity the highest yet recorded for June. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·7 below, of dew point 0°·6 above, and rainfall ·88 in. below, their respective averages. Mean hourly velocity of wind 10·9 miles or 0·5 mile below average; extremes, 26·4 on 20th, and 2·7 on 22nd; prevailing direction, E.S.E. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on the 16th; distant thunder on the 12th, 13th, and 14th. D. G. MANTELL.

Adelaide.—Mean temp. 2°·2 below the average of 39 years. Rainfall ·36 in. above the average. C. TODD, F.R.S.

Sydney.—Rainfall 7·35 in. above, temperature 0°·7 below, and humidity 8·6 above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Fine in the early part of the month. Maximum rain on 8th, 2·25 in., then fine again until the 15th, from which date until the end it was generally showery. Winds throughout moderate and variable, and frequent calms. Fogs on five days. Mean temp. 1°·6 above, and rainfall ·79 in. above, their respective averages. R. B. GORE.

Auckland.—An unusually dry and warm June, the rainfall being quite 1·50 in. below, and the mean temp. 1° above, the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 5·2 miles. Kingston rainfall one-fifth of the average, Island rainfall half the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 2·25 in. above the 30 years average. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, NOVEMBER, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall .	1·94	XI.	Lake Vyrnwy	1·40
,,	Birchington, Thor	2·01	,,	Corwen, Rhug	1·18
,,	Hailsham	1·62	,,	Criccith, Talarvor.....	1·19
,,	Ryde, Thornbrough	·87	,,	I. of Man, Douglas	2·24
,,	Emsworth, Redlands ...	·91	XII.	Stoneykirk, Ardwell Ho.	1·14
,,	Alton, Ashdell	1·31	,,	New Galloway, Glenlee	2·03
III.	Oxford, Magdalen Col..	·73	,,	Lilliesleaf, Riddell	1·14
,,	Banbury, Bloxham	1·20	XIII.	N. Esk Res. [Penicuick]	1·60
,,	Northampton, Sedgebrook	1·04	,,	Edinburgh, Blacket Pl..	·65
,,	Alconbury	·84	XIV.	Glasgow, Queen's Park..	1·07
,,	Wisbech, Bank House...	1·05	XV.	Inverary, Newtown	5·16
IV.	Southend	1·03	,,	Oban, The Corran	4·07
,,	Harlow, Sheering..... ...	...	,,	Islay, Gruinart Schools..	1·25
,,	Colchester, Lexden	·81	XVI.	Dollar.....	1·12
,,	Rendlesham Hall	1·32	,,	Balquhidder, Stronvar...	3·12
,,	Rushall Vicarage	1·49	,,	Ballinluig	·94
,,	Swaffham	1·08	,,	Dalnaspidal H.R.S.....	2·15
V.	Salisbury, Alderbury ...	·65	XVII.	Keith H.R.S.....	1·53
,,	Bishop's Cannings	·73	,,	Forres H.R.S.	1·22
,,	Blandford, Whatcombe .	1·00	XVIII.	Fearn, Lower Pitkerrie..	·41
,,	Ashburton, Holne Vic...	1·57	,,	N. Uist, Loch Maddy ...	3·52
,,	Okehampton, Oaklands.	1·55	,,	Invergarry.....	3·52
,,	Hartland Abbey	1·47	,,	Aviemore H.R.S.	1·02
,,	Lynmouth, Glenthorne.	1·50	,,	Loch Ness, Drumnadrochit	1·15
,,	Probus, Lamellyn	1·14	XIX.	Invershin	·73
,,	Wellington, The Avenue	·87	,,	Scourie	3·92
,,	Wincanton, Stowell Rec.	1·10	,,	Watten H.R.S.....	1·63
VI.	Clifton, Pembroke Road	·75	XX.	Dunmanway, Coolkelure	3·10
,,	Ross, The Graig	·70	,,	Cork, Wellesley Terrace	1·52
,,	Wem, Clive Vicarage ...	1·18	,,	Killarney, Woodlawn ...	1·55
,,	Cheadle, The Heath Ho.	1·36	,,	Caher, Duneske	1·11
,,	Worcester, Diglis Lock	·73	,,	Ballingarry, Hazelfort...	1·02
,,	Coventry, Coundon	1·67	,,	Limerick, Kilcornan ...	·69
VII.	Ketton Hall [Stamford]	...	,,	Broadford, Hurdlestown	1·19
,,	Grantham, Stainby	·95	,,	Miltown Malbay	1·49
,,	Horncastle, Bucknall ...	1·04	XXI.	Gorey, Courtown House	·86
,,	Worksop, Hodsock Priory	1·18	,,	Athlone, Twyford	1·10
VIII.	Neston, Hinderton	·85	,,	Mullingar, Belvedere ...	1·31
,,	Southport, Hesketh Park	1·59	,,	Longford, Currygrane...	1·20
,,	Broughton-in-Furness ...	1·75	XXII.	Woodlawn	1·20
IX.	Ripon, Mickley.....	1·40	,,	Crossmolina, Enniscoe ..	2·39
,,	Melmerby, Baldersby ...	1·36	,,	Collooney, Markree Obs.	1·55
,,	Scarborough, Obs.	1·11	,,	Ballinamore, Lawderdale	1·82
,,	Middleton, Mickleton ...	·85	XXIII.	Lough Sheelin, Arley...	1·24
X.	Haltwhistle, Unthank...	1·08	,,	Warrenpoint.....	1·63
,,	Bamburgh	1·50	,,	Seaforde.....	1·35
,,	Keswick, The Bank.....	1·84	,,	Belfast, Springfield	2·04
XI.	Llanfrechfa Grange	1·03	,,	Bushmills, Dundarave..	1·30
,,	Llandovery	1·42	,,	Stewartstown	1·05
,,	Castle Malgwyn	1·85	,,	Killybegs	2·48
,,	Builth, Abergwesyn Vic.	2·31	,,	Lough Swilly, Carrablagh	...
,,	Rhayader, Nantgwillt ...	2·08			

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NOVEMBER, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	1·17	— 1·49	·43	7	10	50·3	12	25·4	30
II.		Maidstone (Hunton Court)...	·90	— 2·03	·43	7	6	...	...	...	...
,,		Strathfieldsaye	1·39	...	·43	9	9	...	...	...	...
III.		Hitchin	1·10	— 1·58	·48	7	11	50·0	12	20·0	29
,,		Winslow (Addington)	1·28	— 1·65	·53	7	9	53·0	21	21·0	7
IV.		Bury St. Edmunds (Westley)	1·15	— 1·40	·41	1	7	49·0	1, 22	26·0	30
,,		Norwich (Brundall)	1·48	...	·51	14	13	50·4	12	24·2	30
V.		Weymouth(LangtonHerring)	·76	— 2·90	·35	14	8	51·5	12	27·0	30
,,		Torquay (Cary Green)	·84	...	·62	14	6	54·4	21	31·0	7
,,		Polapit Tamar [Launceston]..	1·79	— 2·55	·71	14	12	56·0	19	22·0	4
VI.		Stroud (Upfield)	·94	— 2·39	·48	14	7	48·0	12	25·0	29
,,		ChurchStretton(Woolstaston)	1·27	— 2·25	·40	7	14	50·5	11	22·0	30
,,		Tenbury (Orleton)	·97	— 2·17	·34	14	9	51·3	20	18·8	6
VII.		Leicester (Barkby)	1·13	— 1·16	·54	7	10	51·0	12	17·0	5
,,		Boston	·83	— 1·37	·40	7	8	50·0	5	26·0	6
,,		Hesley Hall [Tickhill].....	1·18	— ·84	·60	7	11	51·0	11	20·0	30
VIII.		Manchester(PlymouthGrove)	1·14	— 1·86	·53	7	10	52·0	12	23·0	5
IX.		Wetherby (Ribston Hall) ..	1·16	— ·91	·49	8	7	...	...	...	...
,,		Skipton (Arncliffe)	2·16	— 4·59	·81	14	10	..	...	...	...
,,		Hull (Pearson Park).	1·41	— ·60	·49	7	11	50·0	1*b*	23·0	30
X.		Newcastle (Town Moor)	1·68	— ·72	·36	15	15	...	...	...	...
,,		Borrowdale (Seathwaite).....	4·28	—10·51	1·13	14	11	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	1·18	— 3·73	·72	14	11	...	...	...	...
,,		Haverfordwest	1·92	— 3·94	·71	14	14	52·5	18	23·9	5
,,		Aberystwith (Gogerddan) ...	1·83	— 3·28	·85	7	9	51·0	12	...	...
,,		Llandudno.....	1·04	— 2·05	·42	7	8	55·5	11	30·4	30
XII.	SCOTLAND.	Cargen [Dumfries]	1·08	— 3·48	·26	14	8	52·8	12	22·0	30
,,		Jedburgh (Sunnyside).....	·88	— 1·62	·21	27	10	51·0	12	20·0	30
XIV.		Colmonell	2·55	...	1·19	14	11	...	...	19·0	30
XV.		Lochgilphead (Kilmory).....	3·99	— 3·30	·88	14	15	...	...	24·0	3
,,		Mull (Quinish).....	4·92	— 2·07	·91	14	18	...	...	...	...
XVI.		Loch Leven Sluices	1·20	— 2·76	·30	14*a*	7	...	...	...	...
,,		Dundee (Eastern Necropolis)	·75	— 1·95	·20	18	10	55·2	11	26·2	4
XVII.		Braemar	1·14	— 3·44	·20	6, 13	11	53·0	22	18·0	30
,,		Aberdeen (Cranford)	1·38	...	·34	14	19	56·0	22	22·0	30
,,		Cawdor (Budgate)	1·24	— 1·61	·73	6	10	...	...	...	...
XVIII		Strathconan [Beauly]	1·53	— 5·03	·50	7	6	...	...	...	...
,,		Glencarron Lodge.....	6·67	...	1·48	9	20	52·0	22	26·6	30
XIX.		Dunrobin	1·68	— 1·15	·80	6	8	56·5	23	30·0	8, 9
,,		S. Ronaldsay (Roeberry).....	2·35	— 1·07	·42	9	18	51·0	22	34·0	7
XX.	IRELAND.	Darrynane Abbey.....	1·94	...	·70	17	15	....	...	...	...
,,		Waterford (Brook Lodge) ...	1·24	— 2·43	·30	30	10	53·0	12*c*	25·0	10
,,		O'Briensbridge (Ross)	1·15	...	·44	17	8	...	...	...	...
XXI.		Carlow (Browne's Hill)	·93	— 2·13	·45	14	8	...	..	...	...
,,		Dublin (FitzWilliam Square)	·66	— 2·17	·19	14	9	54·0	22	26·2	6
XXII.		Ballinasloe	1·28	— 2·63	·32	13	13	53·0	22*d*	22·0	6
,,		Clifden (Kylemore)	3·31	...	·95	17	13	...	...	...	...
XXIII		Waringstown	1·02	— 2·08	·26	17	11	54·0	12*e*	24·0	8
,,		Londonderry (Creggan Res.).	1·32	— 3·20	·40	14	12	...	...	...	...
,,		Omagh (Edenfel)	1·35	— 2·52	·41	14	11	52·0	22	23·0	5

+Shows that the fall was above the average ; —that it was below it.

a—and 18. *b*—and 11, 22. *c*—and 14. *d*—and 23. *e*—and 21.

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METEOROLOGICAL NOTES ON NOVEMBER, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

ADDINGTON.—Only three times during the last 26 years has a smaller rainfall been recorded—viz., in 1871, 1879 and 1889. Foggy only on 7th, 14th and 24th.

BURY ST. EDMUNDS, WESTLEY.—The month was more like March than November, dry easterly winds prevailing. Bar. very high on the 5th, 10th, and from the 21st to the 26th. Favourable for agriculture.

NORWICH, BRUNDALL.—R about half the average. Mean temp. 1°·5 below average. The highest reading of the month is the lowest for many years, and 10° lower than on some days in Nov., 1895. Bar. generally high, and the mean for the month about a quarter of an inch higher than the average. Fog on 14th.

WEYMOUTH, LANGTON HERRING.—A fine, dry, cold month. Mean temp. at 9 a.m. (39°·2) is 5°·2 below the average. For the first time in 25 years the max. temp. in Nov. has been below 52°. The rainfall for the first eleven months of this year—18·66 in.—is the smallest for any corresponding period in 22 years, and only 71 per cent. of the average.

TORQUAY, CARY GREEN.—Rainfall 3·36 in. below the average, the fall for the eleven months, January to November, being 12·11 in. below average. Mean temp. 42°·8, or 4°·5 below average. Duration of sunshine 83 hours 20 minutes, being 21 hours 40 minutes above the average; six sunless days.

POLAPIT TAMAR [LAUNCESTON].—Exceptionally dry and cold, easterly winds prevailing, with the least rainfall for November during 16 years. The total rainfall for the 11 months of the year is 6·86 in. below the average. H on 14th and 15th. Fog on 18th and 22nd. S on 28th.

WOOLSTASTON.—A cold, but seasonable month, sharp frosts on the grass most nights. S fell on 7th. Mean temp. 38°·5.

TENBURY, ORLETON.—A very dry, cold month, the driest November since 1871, and the coldest since 1861, the mean temp. being nearly 5°·5 below the average of 35 years. Severe frost from the 4th to the 7th, and again at the end of the month, and frequently between. Fog on six days. During the past eleven months less than 19 inches of R has fallen, while the average of 65 years is more than 27 inches.

LEICESTER, BARKBY.—A variable month, with deficient rainfall. High winds and bitterly cold weather during the last week. Mean temp. 37°·6.

MANCHESTER, PLYMOUTH GROVE.—The coldest November since observations commenced in 1868, with two exceptions, namely, November, 1871 and 1878. Thick fog on 9th. Dense fog on 4th, 5th, 6th and 17th. Fine autumn weather on the 2nd and 3rd, and the last four days. Mean temp. 38°·5.

ARNCLIFFE.—A very dry month. Rainfall far below the average.

WALES.

HAVERFORDWEST.—A remarkably fine month, with an unusual amount of bright sunshine and many cloudless days. The rainfall was small, occurring principally at night. One of the most frosty Novembers recorded here, most

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of the grass readings being very low. Remarkably high readings of the bar. from 19th to 25th, the mercury standing at 9 p.m. on the 24th at 30·589 in. (corrected). Prevailing winds N.E. and E. The severe frost of the last three days has been equalled only in November, 1890; from 28th to 30th the ice was thick enough to bear on shallow ponds.

ABERYSTWITH, GOGERDDAN.—Very dull and damp throughout the month very little sunshine.

SCOTLAND.

CARGEN [DUMFRIES].—The bar. pressure for the month is 1·365 in. above the average for 37 years, and a higher figure has only thrice been registered at this station—in 1867, 1879 and 1889. The rainfall of the month is one of the lowest on record, having been smaller only in 1867 and 1879. The fall for the eleven months of the year is 5·74 in. below the average. The sky was unusually overcast, the hours of sunshine being only 57, while the average is 88. Easterly winds prevailed on 15 days, a somewhat unusual experience at this season. Farm work progressed rapidly. Snow drops commenced to show their points during the last week.

JEDBURGH.—The month was marked by atmospheric quietness; total rainfall is much below the average, and a good deal of frost prevailed, but it did not last long, and country work was not suspended.

COLMONELL.—Rainfall 2·84 in. less than the average for 20 years. Mean temp. 0°·4 below the average.

S. RONALDSAY, ROEBERRY.—A very good month. Mean temp. 43°·6, or 0°·7 above the average of 6 years.

IRELAND.

DARRYNANE ABBEY.—A dry month. The first part very fine, but cold, with frost on 4th, 5th and 6th; then mild and showery to the 25th, and cold thence to the end. Narcissus above ground, and some few plants of it in flower early in the month.

WATERFORD, BROOK LODGE.—The driest November since 1879.

O'BRIENSBRIDGE, ROSS.—The finest month of November since 1879, when the rainfall was ·99 in. falling on 10 days.

DUBLIN.—A fine, quiet, rather cold month, and the scanty rainfall established a record for November. The bar. ruled high. Mean temp. 43°·2, or 1°·5 below the average. High winds were noted on seven days, and attained the force of a gale on the 5th and 28th. Foggy on 4th, 5th, 6th, 9th, 16th, 17th, 22nd and 24th. Lunar halos were seen on the 13th and 19th; solar halos on the 4th and 9th.

OMAGH, EDENFEL.—The driest November, or rather that with the least rainfall, since records commenced here in 1864, but the saturation of the atmosphere was frequently so great as to produce a measurable quantity of water in the gauge. It was, however, a seasonable month, with no frost sufficient to interrupt its suitability for farm labour.

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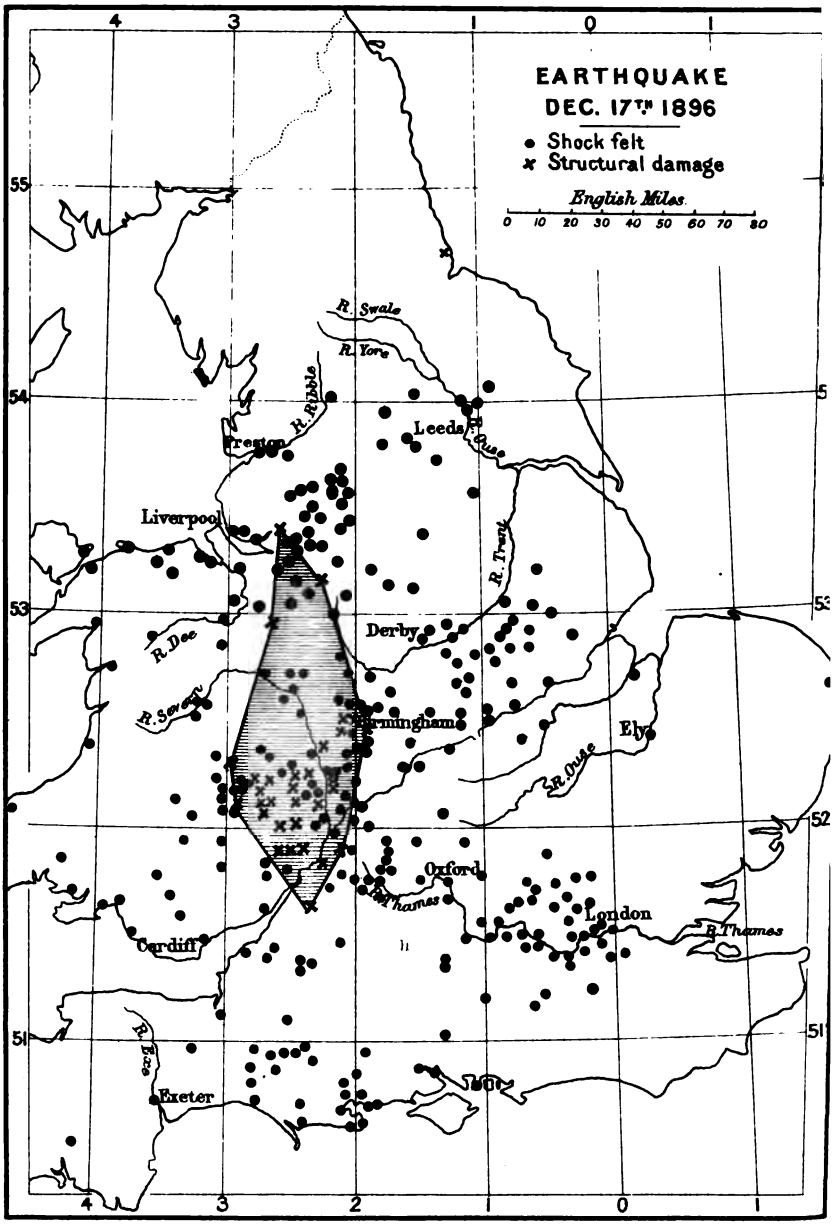

STANFORD'S GEOG^L ESTAB^T LONDON.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXII.] JANUARY, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

THE EARTHQUAKE OF DECEMBER 17TH, 1896.

DR. Davison (of 373, Gillot Road, Birmingham) having announced his intention to prepare a memoir upon the above, we purpose passing on to him all the materials which we have collected, or which may be sent to us.

But it would hardly be appropriate that the greatest English earthquake (except the Colchester one) of modern times should not be noticed in these pages.

We, therefore, proceed to give a few salient features, and also our impressions about them—impressions which possibly the thorough discussion, when completed, may show to be unfounded—but of course we do not expect such a result.

For much of the information upon which this article is founded we are indebted to newspapers, and we are fully aware that many persons regard such a source as unsatisfactory. There are, of course, differences in reporters, but we have had exceptional opportunities for verifying newspaper statements, and believe that, judiciously used, they are very valuable. Besides upwards of 400 such reports, we have many from our own correspondents, and it is on this combined mass of material that these remarks are based.

We begin by indicating the wide area over which the shock of 1896 was felt, and the inner area where it was most violent, as shown by damage to buildings (structural damage). These data are shown by the accompanying map, whence we see that it was felt at points as wide spread as Tavistock and Yarmouth; Weymouth and Hartlepool;* Reigate and Beaumaris—and perhaps beyond these limits. Apparently the area affected was 350 miles in diameter, or one of about 100,000 square miles. Nearly central in this there seems to be an elliptical area of about 130 miles, from N. to S., say from Tortworth (Gloucester) to Manchester, and of a greatest breadth of 40 miles, near the latitude of Birmingham, within which structural damage was produced. This area would be nearly 4,000 square miles,—but the chief damage occurred in the southern portion, including parts of the counties of Hereford, Gloucester and Worcester.

* Perhaps this should be Malton—we are not sure that the disturbance at Hartlepool about 5.0 a.m. had any connection with the earthquake.

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We think that there is evidence that this shock was one of a series which can be traced for 600 years, but we give the facts and some little sketch maps, and leave our readers to draw their own conclusions.

1248. December 21st. "A little before sunset an earthquake at Bath and Wells, which shook and cast down several high buildings."—*Short's Hist. of Weather*, 1749, *I.*, *p.* 145.

"Foure dayes before Christmas was a great earthquake in Englande, so that the toppes of houses were shaken and throwne downe, wals did cleave, and the heads of chimnies and towers were shaken, but the bodies and foundations stirred not."—*Stowe*, *p.* 188.

"The Cathedral of Wells was much injured."—*Matthew Paris*, V., p. 46.

"The tower of Wells Cathedral thrown down. Cathedral of St. David's partially destroyed, and many churches in Somersetshire damaged."—Meldola & White's *East Anglian Earthquake*, 1885, page 5.

1574. February 26th. "Between 5 and 6 p.m. York, Worcester, Gloucester, Bristol, Herefordshire, and neighbouring counties. Plates and books thrown down at Tewkesbury; Ruthen Castle partly destroyed; Bell in Denbigh market place sounded twice, and several chimneys thrown down. People kneeling in Norton Chapel (near Gloucester?) were almost all thrown down."—*East Anglian Earthquake*, p. 5.

1705. "Extended from Leeds to Bristol, and from Norwich to Liverpool; subterranean noise."–Roper's *Earthquakes*, 1889.

1863. October 6th, about 3.22 a.m. The outside limits indicated by the places mentioned are Dublin, Ulverstone, Scarborough, Market Rasen, Peterborough, Bury St. Edmunds, London, Brighton, I. of Wight, Dorchester, Plymouth, Wicklow, Dublin. The only places at which structural damage occurred, were Ross, Hereford; Worcester, and Congleton.—E. J. LOWE, F.R.S., in *Proceedings Met. Soc.*, 1864, II., p. 55.

1868. October 30th, 10.35 p.m. Outside limits, Blackpool, Nottingham, London, I. of Wight, Tavistock, Bodmin, Pembroke, Lampeter, Blackpool. No structural damage reported and shock feeble."—*Met. Mag.*, 1868, III., p. 153.

1888. April 11th, 7.10 p.m. Very slight, but felt at Oswestry, Dolgelly, Llangollen and Rhiwbrifdir.—*Meteor. Mag.*, 1888, XXIII., pp. 64, 73.

1892. August 18th, 0.24 a.m. Felt in S.E. of Ireland, all Wales, and in Cornwall, Hereford and Worcester. Damage slight.—*Meteor. Mag.*, 1892, XXVII., p. 113.

1893. November 2nd. Very similar to the shock of 1892.—*Meteor. Mag.*, 1893, XXVIII., p. 152.

The details for 1896 have already been given, and the set of small maps needs no explanation.

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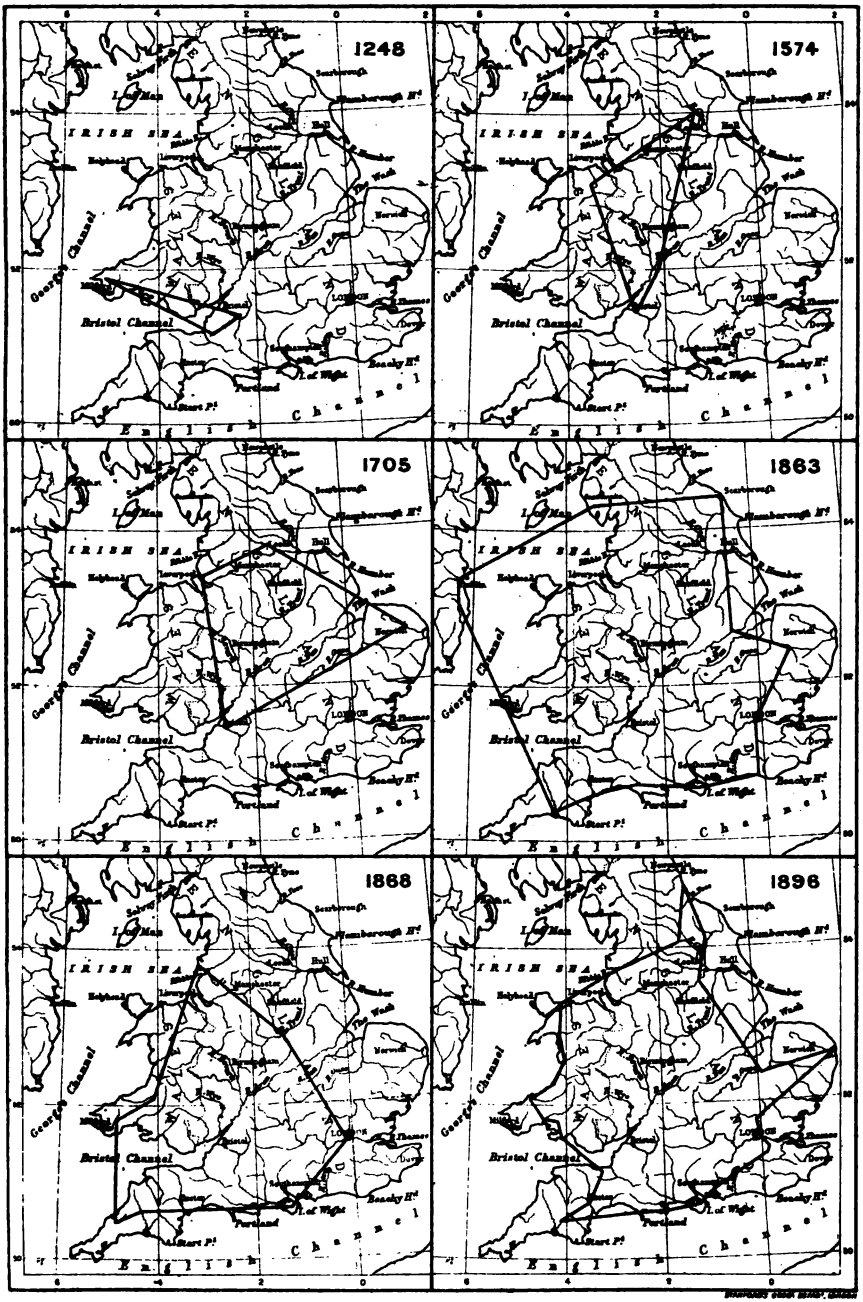
APPROXIMATE BOUNDARIES OF EARTHQUAKE SHOCKS.



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The similarity in the area affected by these shocks seems to us very remarkable. Every place mentioned in 1574 is among those whence we have reports for 1896, and not one of them is outside the 1896 area; and the agreement between the areas of 1863, 1868, and 1896 is extremely close.

As regards violence, and for that district, 1248 seems to have been the worst, next to it 1896, then 1705, 1863, and least of all 1868.

Compared with the Essex shock of April 22nd, 1884, the pecuniary damage in 1896 is much less; but it is spread over an area ten times as great as that to which the 1884 damage was limited; 4,000 square miles against 400.

OBSERVERS' NOTES ON THE 1896 EARTHQUAKE.

MIDDLESEX.

London.—Bartholomew Villas, N.W. Shock felt, time 5.35 a.m. R. INWARDS.

Lower Edmonton.—Jugs rattled more than they could be made to do by walking near them, time 5.35 a.m. PERCY M. BEAREY.

SURREY.

Guildford.—Slight shock felt about 5.45 a.m. M. L. C. MATHEW.

Yorktown.—Was awakened by the shock. T. K. BISHOP.

HERTS.

St. Albans.—Was awake, and felt the shaking begin quite suddenly, continue perhaps half-a-minute, and then as suddenly stop; time within a minute or two of 5.30 a.m. E. A. ORMEROD.

Kensworth.—Furniture, crockery, &c., shaken, at 5.35 a.m. S. GRACE JONES.

BUCKS.

Slough, Upton.—Shock very perceptible. R. BENTLEY.

Slough, Fulmer.—House shook very much, and the pictures on the walls rattled. C. B. FOSTER.

Winslow, Addington.—Shock felt. J. MATHISON.

OXFORD.

St. Giles's.—Shock felt about 5.30 a.m. ELEANOR M. TAWNEY.

NORTHANTS.

Castle Ashby.—Sleepers were awakened by a rumbling noise, like that of a heavily laden waggon, which was followed immediately by a distinct shaking of beds and furniture, about 5.30 a.m. R. G. SCRIVEN.

Pitsford, Sedgbrook.—Shock felt and furniture rattled at 5.34 a.m. C. A. MARKHAM.

Duddington [Stamford].—A rumbling sound like that of a traction engine, or furniture being moved, preceded the shock, which threw down a small clock. F. COVENTRY.

HUNTS.

St. Neots, Great Paxton.—Three inmates of the vicarage, in different rooms, felt a shock at 3.30 a.m., and that at 5.30 a.m. was not felt. A. G. CANE.

DORSET.

Langton Herring.—Shock felt distinctly about 5.35 a.m., apparently going from E. to W., and lasting five or six seconds. C. H. GOSSET.

SOMERSET.

N. Cadbury.—Shock much like many I have felt in Patras, apparently going towards S.W., time about 5.32 a.m. H. A. BOYS.

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GLOUCESTER.

Bristol, Over Court.—Was awakened by shock which seemed to be shaking the house, and was accompanied by noise, in a second or two it seemed as if the S.E. corner of the house was falling in ruins on the gravel, but daylight showed no injury. R. C. CANN LIPPINCOTT.

Stroud, Upfield.—Distinct shock about 5.30 a.m. ROSE E. STANTON.

Cheltenham (Naunton Park Villas).—The shock occurred about 5.34 a.m., and lasted about 5 secs., direction apparently N.—S. It was preceded by a heavy rumbling noise, and some persons who were awake maintain that they saw a brilliant flash of lightning. My bed was shaken violently, furniture and crockery shook and rattled, and the house bells rang, but no structural damage occurred. W. LLEWELLYN EVANS.

Tewkesbury (Beckford).—Sharp shock at 5.34 a.m.—only one shock, but it lasted 6 or 7 seconds. My bed rocked about as much as a railway carriage going at full speed. The shock was preceded a second or two, and accompanied, by a rumbling not like thunder but more in the earth, somewhat resembling that made by a train passing a wide-span girder-bridge. Doors, pictures, and crockery shook and rattled. F. SLADE.

HEREFORD.

Ross, The Graig.—The most severe shock remembered here, occurred about 5.33 a.m., lasting 8 or 10 secs., and caused some loose chimneys to fall. It was accompanied by a loud rumbling noise like that of a traction engine, steam roller, or motor car. H. SOUTHALL.

SALOP.

Bridgnorth, Quatford House.—I was awoke at 5.31 a.m. by a shaking and by a rumbling sound, which I think lasted about 6 secs. A labourer who works for me has just told me that last night a tumbler was left upside-down on a table, this morning it was found in the same position but with the bottom cut clean off! T. MAYO.

Church Stretton, Woolstaston.—Two shocks were felt here, the first slight, the second at 5.30 a.m. very severe and accompanied by a loud rumbling sound, like a heavy waggon. Furniture and crockery violently shaken. E. DONALD CARR.

Wem, The Clive Vic.—Shock at 5.35 a.m., with lightning, causing crockery to rattle, and making game and other birds crow and cry. J. COOPER WOOD.

WORCESTER.

Malvern.—I was awakened by my bed oscillating and the fire-irons rattling for several seconds; there was also a rumbling noise; time a little before 5.35 a.m. C. S. PRINGLE.

Orleton.—Severe shock about 5.37 a.m. T. H. N. DAVIES.

LEICESTER.

Barkby.—Considerable shock at 5.35 a.m. E. N. POCHIN.

LANCASTER.

Garstang, Bruna Croft.—At, or about, 5·35 a.m., having been awake about ten minutes, I heard the water jug, full of water, shake in the basin, and the window rattle slightly, this went on for some six to ten seconds.

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I immediately said, "Why that must be an earthquake," because though trains three-quarters of a mile distant sometimes make the windows rattle, they never affect the water jug. SYDNEY WILSON.

Garstang, Elswick Lodge.—Slight shock between 5.30 and 5.35 a.m. S. KING.

MONMOUTH.

Llanfrechfa.—Slight tremors about 5.30 a.m., and noise as of a heavy waggon on a hard road. F. J. MITCHELL.

CARMARTHEN.

Llandovery.—Shock felt about 5.40 a.m. J. WATKINS.

PEMBROKE.

Haverfordwest.—Slight shock about 5.30 a.m. E. P. PHILLIPS.

MERIONETH.

Rhiwbrifdir.—Shock felt about 5.30 a.m. R. ROBERTS.

CARNARVON.

Llanystumdwy, Talavor.—Shock about 5·35 a.m. J. ROBERTS.

Llandudno.—Slight shock about 5.30 a.m. J. NICOL.

TIME.

Here, as in every previous earthquake, there is ample proof of the carelessness of most persons as to keeping accurate time, and of the tendency to quote round figures (*e.g.*, 5.30 or 5.40) rather than accurate ones.

It will be for Dr. Davison, if he can, to bring order out of chaos; meanwhile we offer the following as our impression of what was the initial time of the disturbance—viz., 5.32 a.m.—and the rate of progress, 30 miles per minute from Hereford as a centre.

The following records* all agree with the above conditions within one minute :—

Within 30 *miles of Hereford*, 5.32 *a.m.*

Glasbury, Radnor, A. Battiscombe 5.33	Monmouth, Monmouth, C. H. Culley 5.32
Hereford, Hereford, W. Pilley 5.32	Ross, Hereford, H. Southall 5.33
Kinnersley, ,, *Press* 5.33	Tewkesbury, Gloucester, Rev. E. H. Cosens 5.32
Ludlow, Salop, *Press* 5.32	Worcester, Worcester, *Nature* 5.31

30 *to* 60 *miles from Hereford*, 5.33 *a.m.*

Bath, Somerset, Rev. H. H. Winwood 5.32	Cardiff, Glamorgan, A. Mee 5.32
N. Cadbury, Somerset, Rev. H. A. Boys 5.32	Cheltenham, Gloucester, Rev. M. A. Smelt 5.33
Birmingham, Dr. Davison 5.32½	,, W. Ll. Evans 5.34
Bristol, Gloucester, *Press* 5.34	Kidderminster, Worcester, *Press* 5.32
	Neath, Glamorgan, Signalman 5.33

* Of course, it may be said that by selecting your figures you can prove anything. We admit the general proposition, but are sure that in this case it does not apply, because nearly all the best observers appear in this list. It would be invidious to set out their qualifications, but there is the Director of Kew Observatory, there are several Fellows of the Royal Astronomical and Royal Meteorological Societies, and—to our mind, strongest fact of all—there are the only railway signalmen whose reports we have seen, men who were bound to be awake, bound to have their clocks right, and bound to record time accurately by day and by night.

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60 *to* 90 *miles from Hereford*, 5.34 *a.m.*

Barkby, Le'ster,	Rev E. N. Pochin	5.35	
Derby, Derby,	*Press*	5.33	
,, ,,	,,	5.34	
Dunton Bassett, Leicester,	Rev. A. Chiswell	5.34	
Leicester,	Signalman	5.34	
Oxford, Oxford,	*Press*	5.35	
Sedgbrook, Northants,	C. A. Markham	5.34	
Talarvor, Carnarvon,	J. Roberts	5.35	
Whitchurch, Salop,	*Press*	5.35	
Witney, Oxford,	*Press*	5.35	

90 *to* 120 *miles from Hereford*, 5.35 *a.m.*

Attercliffe, Yorks,	*Press*	5.35
Bolton, Lancashire,	W. W. B. Hulton	5.35
,, ,,	W. W. Midgley	5.35
Chorlton-cum-Hardy,	H. Whale	5.35
Didsbury, Lancashire,	*Press*	5.35
Edgeware, Middlesex,	Judd	5.35
Hitchin, Herts,	*Press*	5.35
Kensworth, Herts,	J. Jones,	5.35
Kew Obsy., Surrey,	Dr. Chree	5.35
Manchester,	*Press*	5.36
Manchester (St. Bede's),	Rev. L. C. Casartelli	5.35
Melton Mowbray, Le'ster,	*Press*	5.35
Pinner, Middlesex,	F. H. Mabbett	5.34
Preston, Lancashire,	Dr. Brown	5.35
Watford, Herts,	Dr. Attfield, F.R.S.	5.34
Weymouth, Dorset,	Rev. C. H. Gosset	5.35
Wilmslow, Cheshire,	W. Mann	5.35

120 *to* 150 *miles from Hereford*, 5.36 *a.m.*

Castleford, Yorks,	*Press*	5.36
Dulwich, Kent	*Press*	5.37
Edmonton, Middlesex,	P. M. Bearey	5.35
Garstang, Lancashire,	S. Wilson	5.35
Hellifield, Yorks,	Signalman	5.35
Leeds, Yorks,	*Press*	5 35
London (City),	E. Lionel Scott	5.35
,, (Highbury),	C. Nicoll	5.35
,, (Kentish Town),	R. Inwards	5.35
Nutfield, Surrey,	H. Nicholls	5.37
Wisbech, Cambridge,	A. Peckover	5.35

Minor Shocks.

Prof. Milne's seismometer shows tremors for several hours before the great shock, and he has asked whether anyone felt shocks during those hours. We submit a few records without guaranteeing their accuracy, because they may indicate where inquiry should be made.

2.10. *Evesham, Worcester.*—"Two shocks; (1), 2.10 a.m.; (2), 5.40 a.m."

3.0. *Clifton-on-Teme, Worcester.*—"A few inhabitants were startled by a slight earthquake at 3 a.m.; at 5.30 there was a severe one."

3.15. *Much Wenlock, Salop.*—"Slight shock 3.15, and violent one at 5.35."

3.50. *Malvern, Worcester.*—"A shock is said to have been felt at 3.50 a.m."

3.50. *Malvern, Worcester.*—"I got up at the first shock at 3.50, thinking that some one had knocked."—J. G. Powell, Coombe Lodge.

4.0. *Wolverhampton.*—"Two shocks, one about 4 a.m., the other an hour later."

4.15. *Droitwich, Worcester.*—"Slight shock at 4.15; very severe at 5.35 a.m."

4.20. *Droitwich, Worcester.*—"Shock at 4.20, slight."

4.30. *Cardiff.*—There seem to have been two shocks, one about 4.30, and the other an hour later."

5.0. *Whitchurch, Salop.*—"Two shocks; one at 5.0, the other more severe at 5.37."

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5.50. *Dulwich, Surrey.*—"About ¼ hour after the great shock, there was another, very slight."

5.57. *Southampton.*—"Two shocks here; (1), 5.40; (2), 6.3. [As his first time shows his clock to be 6 m. fast, we have entered the second shock as 5.37.]"

Luminous Phenomena.

We do not think that the evidence upon this head proves more than that there was a local thunderstorm at about the same time as the shock. We accept no responsibility for the following statements, but give all that we have seen, and leave our readers to determine their value.

Kinnersley, Herefordshire.—"There was noticed to be a very clear light during the time the shock was on."

Bridgnorth, Salop.—"Previous to the disturbance the streets seemed to be on fire!"

Wem, Salop.—"Shock at 5.35 a.m., with lightning."—J. Cooper Wood.

Evesham, Worcester.—"Directly the vibration ceased, a brilliant light appeared in the sky, and this continued for an appreciable time."

Evesham, Worcester.—"A few persons state that at the time of the shock there was apparently a flash of lightning."

Kidderminster, Worcester.—"The shocks were preceded by a luminous flash lighting up the northern sky."

Worcester.—"Alderman Price believes that there was a flash of lightning at the time, and others confirm this."

Liverpool.—"There was a heavy thunderstorm, accompanied by vivid lightning and terrific hail, followed by an earthquake."

Liverpool.—"A thunderstorm followed the earthquake in about 15 minutes."—F. W. Saxby, 42, Lidderdale Road.

Manchester.—"Several men who were setting out for their work at Stretford, state that they saw a red light in the sky, in the direction of Warrington; they heard no sound, but thought that some chemical works must have been blown up."

Warrington.—"The earthquake here at 5.35 was preceded by a loud clap of thunder at 5.30 a.m."

Widnes.—"The earthquake was followed by a thunderstorm."

Malton, Yorks.—"At 5.30 a.m. I was driving from Terrington to Welburn, and when south of Brandreth Farm, near Bulmer, both my groom and I saw a sudden flash of light veiled in the fog, which I at first took to be lightning, but afterwards concluded to be the reflection from a meteor. . . . Is it possible that we were at the edge of the disturbance, and that the flash of light was part of the lightning of the thunderstorm experienced in the vicinity of Widnes and Liverpool?"—John Dougall, M.D., The Grange, Welburn, York.

Knighton, Radnor.—"People out of doors say that there was a great flash of lightning at the time, which fairly lighted up the place."

Newtown, Montgomery.—"A shock of earthquake was felt here, after a stormy night, with vivid lightning."

Rhyl, Flint.—"The shock was followed by a hail storm."

Ruthin, Denbigh.—"The driver of the mail coming through Llanbedr at the time [of the shock] reported thunder and lightning.

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SOUND.

It is, we believe, denied that any sound is produced by an earthquake. We could quote 200 reports of sound in connection with the present one, but we should probably be told (1) that persons suddenly awakened are not competent recorders of physical phenomena, (2) that the noise may be accounted for by the creaking of the timbers of houses when they are being shaken.

We quote some statements by persons who were awake, and who heard noise before they felt anything.

Father Vincent McNabb, who was standing in his room at the Dominican Priory, Woodchester, Stroud, says: "After a distant sound, I noticed slight trembling of the walls and floor. Sound and motion increased in volume until I thought that some heavy cart was rumbling over the tiled cloister."

A Tewkesbury correspondent says: "I was lying awake when I heard a distant rumbling, the sound getting nearer and nearer, till it felt like a traction engine close by."

Mr. Walter Pilley, of Hereford, who was just going out, says: "At 5.32 a.m. I heard a peculiar rumbling noise, as of a traction engine, then followed two terrific crashes, the second appearing to be louder than the first; succeeding this, the house seemed to be lifted and rocked."

An observer at Eardisley, Hereford, distinctly differentiates, in the following words, the noise of the earthquake, and that of the straining of the house: "The rumbling noise lasted about 3 secs., and terminated with a sudden shock, which made the beams of the house creak and the windows rattle."

From Ledbury we hear: "Its first warning was a noise as of a sudden rising of the wind, which during the night had been unusually quiet; this noise increased with great force, and was immediately accompanied by a tremendous shaking of houses, &c."

The following letter is self explanatory.

To the Editor of the Standard.

SIR,—In a Leading Article in *The Standard* of Friday last, relating to the late earthquake, you state that "Several correspondents of a class accustomed to observe accurately, and who may be assumed to record their observations without exaggeration, distinctly assert that the tremors were neither preceded nor accompanied by any unusual noise." I may say that, in this district at any rate, the shock was announced by a loud rumble, not unlike the sound of a fast train passing close to the house of the observer. The sound awoke me, and was heard by two more of the family. This rumble was immediately followed by a violent shaking of the premises, which lasted about 20 secs.—I am, Sir, your obedient Servant,

R. V.

Little Hereford, Tenbury, December 20th.

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The report from Ludlow is—"The approach of the shock was indicated by a loud rumbling noise, which grew louder, and then there was a severe shaking of the earth."

We have many similar statements, but we will give only one more—the graphic, characteristic, and, as regards the sound, apparently unanswerable statement of Father Ignatius as to the occurrence at Llanthony Abbey, Abergavenny, Mon. "This morning [*i.e.*, before he could have received outside information.—ED.], while our community were in church between 5 and 6, at the usual morning service, very strange phenomena startled us all. 'Suddenly there came a sound as of a rushing mighty wind,' and then twice 'the place was shaken where they were assembled together,' the whole lasting about 8 secs. There was no feeling, but only 'the sound of a mighty rushing wind.' There was no rumbling underground, but the whole massive building and everything in it swayed violently twice. I at once ordered everyone to leave the building. . . . . The remarkable portion of the experience was the rushing sound in the air that preceded the shocks. It seems that there must have been some tremendous body of meteors rushing through the air, and then, coming in contact with the ground, they produced the shocks."

REVIEWS.

Die Beurtheilung des Wetters auf mehrere Tage voraus. von Dr. W. J. VAN BEBBER. Sm. 8vo. Stuttgart: F. Enke, 1896. 52 pp., 8 maps.

AN interesting and popularly written paper upon the possibility of forecasting the weather for "several days," instead of, as is now done by most Government establishments, for "one day."

This is not the place to discuss the amount of success which attends the official forecasters; and Dr. van Bebber will at once admit that his "several days'" forecasts must of necessity be less certain of fulfilment than those for "one day."

Assuming, however, that the ordinary "one day" forecasts are a success, evidently "several days" forecasts which approach success would be very useful.

Dr. van Bebber has had long experience of the ordinary system, and has studied, probably as carefully as anyone, the normal paths of depressions across Europe; he thinks that those studies prove that these paths can be anticipated, and of course, if so, then the weather for "several days" can be foretold.

We hope that it is so; but our impression is that if Dr. van Bebber instead of living at Hamburg had lived at Valencia, his views would have been somewhat less firmly held.

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On a Whirlwind at Bloxworth [*Dorset*], by the Rev. O. PICKARD-CAMBRIDGE, M.A., F.R.S. (Proc. Dorset Natural History and Antiquarian Field Club). 8vo. Dorchester, 1896. 4 pp., 3 plates.

AN excellent account of the damage wrought by a whirlwind on the night of November 10th, 1895. It is illustrated by a map on the scale of five inches to a mile, and by two photo-blocks of the wrecked trees. The track was S.W.–N.E., about a mile long, and from 80 to 100 yards in breadth.

Round the Year: a Series of short Nature Studies by PROF. L. C. MIALL, F.R.S. London: Macmillan & Co., 1896, sm. 8vo., 295 pages.

THIS is the most Gilbert-Whitish book that we have seen for a long time. Like "The Natural History of Selborne" it is chiefly devoted to notes on animal and vegetable life; but, like it, running off into bits of meteorology, fogs, snow and snow crystals, underground temperature, &c. The parallelism between the two writers is so great that we are surprised that Crag Foot does not appear as Selborne does, among the list of rainfall stations.

To those who have eyes to see, and desire to know something of the world in which they live, and who wish for an able and cheerful companion, we say, "Read *Round the Year*." The book is so fascinating to lovers of nature that they will feel great reluctance to lay it down before they have read to the end.

CIEL ET TERRE.

WE congratulate M. Lancaster and his co-Editors of *Ciel et Terre* upon obtaining a unique distinction.

M. Mailly was a member of the staff of the Royal Observatory of Bruxelles, and also a member of the science section of the Royal Academy of Belgium; he died in October, 1891, and left 10,000 francs (£400) to the Royal Academy to found a prize to be awarded to the Belgian who had made some astronomical discovery, or had contributed to the progress of astronomy in the country.

The Royal Academy accepted the legacy, founded the "Mailly prize" of 1000 francs (£40), to be granted each four years, and on December 15th, 1896, awarded the first prize to the Editors of *Ciel et Terre*.

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RAINFALL AT OVINGTON, ENNERSDALE, NATAL.

Lat 29° S. Lon. 29½° E. Altitude 3715 ft. ?

By the Rev. A. H. Stocker.

	Monthly Depth.					Number of Wet Days.					Averages for 5 Years.	
	1891 to 1892	1892 to 1893	1893 to 1894	1894 to 1895	1895 to 1896	1891 to 1892	1892 to 1893	1893 to 1894	1894 to 1895	1895 to 1896	Rain.	Days.
	in.	in.	in.	in.	in.						in.	
July	·20	·07	·19	—	—	3	1	3	—	—	·09	1
Aug.	·11	1·70	·33	·71	·11	6	5	4	5	2?	·59	5
Sept.	·56	2·94	5·64	2·46	·83	6	7	13	7	3	2·49	7
Oct.	3·50	6·00	4·75	1·13	·79	16	19	15	10	4	3·23	13
Nov.	1·78	4·18	*12·05*	3·54	3·08	15	12	16	11	9	4·93	13
Dec.	5·57	3·06	6·10	3·19	7·97	16	8	18	16	18	5·18	15
Jan.	3·46	6·84	9·21	3·25	4·93	12	20	14	18	12	5·54	15
Feb.	4·10	4·06	4·66	6·96	7·33	14	12	10	12	14	5·42	12
Mar.	3·24	4·56	2·68	5·00	1·83	17	17	13	17	9	3·46	15
April	1·18	1·34	2·68	·54	3·26	6	4	7	8	8	1·80	6
May	·47	·14	·71	·27	·79	7	2	8	4	2	·48	5
June	—	·06	·25	—	·71	—	1	2	—	2	·20	1
	24·17	34·95	49·25	27·05	31·63	118	108	123	108	83	33·41	108

Note.—In 1895 there was an absolute drought for 92 days, from May 20th to August 19th; and in 1896 one for 52 days, from June 17th to August 7th.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1896.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	88·7	14	47·7	2, 29	77·5	55·2	52·6	65	133·0	41·1	1·03	7	...
Malta	103·0	19	63·3	1	87·7	69·0	65·6	66	150·7	58·1	·00	0	1·5
Mauritius	75·4	1	57·0	5	72·9	62·9	58·5	74	123·7	46·6	1·82	20	5·1
Calcutta	91·9	1	77·5	21	88·4	79·3	78·5	87	158·8	76·3	12·08	19	8·5
Bombay	87·6	6	75·1	21	84·2	77·6	76·6	87	137·9	70·2	36·44	31	9·3
Ceylon, Colombo	88·4	6	73·5	25	86·6	75·2	75·4	85	155·0	71·5	2·85	10	7·0
Melbourne	61·0	3	32·9	31	54·1	42·4	41·2	77	109·5	23·0	2·00	18	5·8
Adelaide	68·4	3	34·4	10	58·6	42·1	41·4	75	124·2	26·4	1·26	18	6·0
Sydney	66·9	5	39·8	2	56·1	43·9	77·0	80	103·0	27·9	2·53	10	3·5
Wellington	59·0	19	36·0	21	54·7	43·9	41·8	75	110·0	23·0	5·83	20	4·5
Auckland	64·0	9	42·0	17	57·9	47·3	44·8	76	119·0	38·0	8·70	30	6·5
Jamaica, Kingston	93·9	13	69·6	1	89·8	74·4	70·4	68	...	...	·99	6	...
Trinidad	92·0	10*a*	69·0	var.	88·2	70·5	73·5	83	174·0	68·0	6·35	22	...
Grenada	85·2	29	70·0	7	82·5	74·4	71·1	81	149·2	...	10·75	28	3·5
Toronto	91·3	12	47·2	16	80·0	59·4	59·3	72	106·0	40·0	2·18	10	5·0
New Brunswick, Fredericton	90·7	2	46·0	18	77·5	54·0	56·8	68	...	...	3·80	10	5·0
Manitoba, Winnipeg	90·5	1	42·7	23	75·9	53·7	...	...	...	...	2·01	11	6·0
British Columbia, Esquimalt	78·2	5	44·2	29	71·2	51·1	54·1	85	...	...	·00	0	3·0

a—and 13.

REMARKS.

MALTA.—Adopted mean temp. 77°·6, or 0°·1 above the average. Mean hourly velocity of wind 7·0 miles. Average temp. of sea 77°·3. TS on 13th. L on 21st.
J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·2, of dew point 0°·9, and rainfall ·48 in., below, their respective averages. Mean hourly velocity of wind 11·4 miles, or 0·4 mile below average; extremes, 26°·4 on 11th, and 2·0 on 1st; prevailing direction, E.S.E.
T. F. CLAXTON.

Adelaide.—Mean temp. 1°·2, and rainfall 1·43 in., below the average of 39 years. A dry winter generally, especially in the north, after a dry hot summer.
C. TODD, F.R.S.

Sydney.—Rainfall 1·71 in., temperature 2°·4 below, and humidity 3·3 above, their respective averages.
H. C. RUSSELL, F.R.S.

Wellington.—Generally fine in the early part of the month, with showers at intervals; the latter part very wet. Maximum rainfall on 25th, 1·23 in. Winds throughout light and variable; frequent calms; several frosty nights. T on 14th. H on 19th, and fog on 7th and 21st. Temperature 1°·7 above, and rainfall ·51 in. below, their respective averages.
R. B. GORE.

Auckland.—A rainy and stormy month, the total rainfall being nearly three inches in excess of the average of 30 years. Mean temp. slightly above the average.
T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 4·4 miles. Kingston rainfall about half the average.
R. JOHNSTONE.

TRINIDAD.—Rainfall 3·10 in. below the 30 years average.
J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, DECEMBER, 1896.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall.	5·22	XI.	Lake Vyrnwy	6·21
,,	Birchington, Thor	3·62	,,	Corwen, Rhug	5·08
,,	Hailsham	4·95	,,	Criccith, Talarvor.....	5·76
,,	Ryde, Thornbrough	4·92	,,	I. of Man, Douglas	7·28
,,	Emsworth, Redlands ...	4·34	XII.	Stoneykirk, Ardwell Ho.	5·13
,,	Alton, Ashdell	5·19	,,	New Galloway, Glenlee	7·68
III.	Oxford, Magdalen Col..	3·03	,,	Lilliesleaf, Riddell	4·79
,,	Banbury, Bloxham	3·74	XIII.	N. Esk Res. [Penicuick]	5·85
,,	Northampton, Sedgebrook	3·37	,,	Edinburgh, Blacket Pl..	3·35
,,	Alconbury	2·59	XIV.	Glasgow, Queen's Park..	4·85
,,	Wisbech, Bank House...	3·10	XV.	Inverary, Newtown	8·74
IV.	Southend	2·63	,,	Oban, The Corran	7·70
,,	Harlow, Sheering..... ...	...	,,	Islay, Gruinart School ...	2·09
,,	Colchester, Lexden	2·72	XVI.	Dollar.....	5·87
,,	Rendlesham Hall	2·56	,,	Balquhidder, Stronvar...	10·52
,,	Rushall Vicarage	3·51	,,	Ballinluig	6·08
,,	Swaffham	4·01	,,	Dalnaspidal H.R.S.....	8·84
V.	Salisbury, Alderbury ...	5·31	XVII.	Keith H.R.S.....	5·43
,,	Bishop's Cannings	4·04	,,	Forres H.R.S.	2·50
,,	Blandford, Whatcombe.	6·60	XVIII.	Fearn, Lower Pitkerrie..	2·81
,,	Ashburton, Holne Vic...	9·61	,,	N. Uist, Loch Maddy ...	4·94
,,	Okehampton, Oaklands.	8·46	,,	Invergarry.....	7·28
,,	Hartland Abbey	7·14	,,	Aviemore H.R.S.	3·25
,,	Lynmouth, Glenthorne.	7·93	,,	Loch Ness, Drumnadrochit	3·41
,,	Probus, Lamellyn	9·22	XIX.	Inversahin	2·45
,,	Wellington, The Avenue	6·09	,,	Scourie	3·60
,,	Wincanton, Stowell Rec.	5·76	,,	Watten H.R.S.....	4·10
VI.	Clifton, Pembroke Road	4·11	XX.	Dunmanway, Coolkelure	12·92
,,	Ross, The Graig	3·47	,,	Cork, Wellesley Terrace	6·47
,,	Wem, Clive Vicarage ...	3·04	,,	Killarney, Woodlawn ...	7·66
,,	Cheadle, The Heath Ho.	4·40	,,	Caher, Duneske	5·87
,,	Worcester, Diglis Lock	2·65	,,	Ballingarry, Hazelfort...	4·12
,,	Coventry, Coundon	3·60	,,	Limerick, Kilcornan ...	3·60
VII.	Ketton Hall [Stamford]	...	,,	Broadford, Hurdlestown	4·09
,,	Grantham, Stainby	3·96	,,	Miltown Malbay	6·27
,,	Horncastle, Bucknall ...	3·55	XXI.	Gorey, Courtown House	7·82
,,	Worksop, Hodsock Priory	2·55	,,	Athlone, Twyford	5·02
VIII.	Neston, Hinderton	3·07	,,	Mullingar, Belvedere ...	5·86
,,	Southport, Hesketh Park	4·37	,,	Longford, Currygrane...	4·84
,,	Broughton-in-Furness ...	8·49	XXII.	Woodlawn	6·61
IX.	Ripon, Mickley.....	4·15	,,	Crossmolina, Enniscoe ..	7·56
,,	Melmerby, Baldersby ...	3·37	,,	Collooney, Markree Obs.	5·20
,,	Scarborough, Obs.	2·71	,,	Ballinamore, Lawderdale	5·59
,,	Middleton, Mickleton ...	3·85	XXIII.	Lough Sheelin, Arley...	4·31
X.	Haltwhistle, Unthank...	3·84	,,	Warrenpoint.....	6·59
,,	Bamburgh	4·94	,,	Seaforde.....	5·95
,,	Keswick, The Bank	5·67	,,	Belfast, Springfield	5·73
XI.	Llanfrechfa Grange	6·84	,,	Bushmills, Dundarave..	4·22
,,	Llandovery	7·49	,,	Stewartstown	4·34
,,	Castle Malgwyn	9·54	,,	Killybegs	7·52
,,	Builth, Abergwesyn Vic.	12·68	,,	Lough Swilly, Carrablagh	4·54
,,	Rhayader, Nantgwillt ...	10·08			

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DECEMBER, 1896.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.
			inches.	inches.	in.						
I.	ENGLAND.	London (Camden Square) ...	3·61	+ 1·54	·75	2	21	51·8	26	26·6	19
II.		Maidstone (Hunton Court)...	3·15	+ ·91	·70	13	16	...	...	...	...
,,		Strathfieldsaye	4·75	...	1·04	4	19	...	...	...	...
III.		Hitchin	3·21	+ 1·18	·65	4	23	53·0	26	26·0	18
,,		Winslow (Addington).....	3·59	+ 1·14	·62	4	25	51·0	26*b*	23·0	24
IV.		Bury St. Edmunds (Westley)	3·82	+ 1·58	·79	4	21	52·0	26	26·0	19*g*
,,		Norwich (Brundall)	3·25	...	·33	4	26	52·2	26	24·8	19
V.		Weymouth(LangtonHerring)	5·65	+ 2·55	·81	5	23	50·0	28	26·0	21
,,		Torquay (Cary Green)	7·37	...	1·43	1	24	54·1	28	29·0	18
,,		Polapit Tamar [Launceston]..	6·72	+ 2·49	·81	13	25	52·4	26	22·0	18
VI.		Stroud (Upfield)	3·60	+ 1·15	·59	4	24	51·0	30	27·0	17
,,		ChurchStretton(Woolstaston)	4·40	+ 1·35	·81	4	23	51·5	26	23·5	1
,,		Tenbury (Orleton)	3·78	+ 1·41	·68	4	19	55·3	26	21·8	24
VII.		Leicester (Barkby)	3·37	+ 1·23	·48	4	24	52·0	26*c*	21·0	23
,,		Boston	2·68	+ ·83	·30	1*a*	22	50·0	25	26·0	16
,,		Hesley Hall [Tickhill].....	2·41	+ ·43	·44	4	20	55·0	26	20·0	1
VIII.		Manchester(PlymouthGrove)	3·56	+ ·12	·50	26	20	50·0	10	26·0	21*h*
IX.		Wetherby (Ribston Hall) ...	2·15	— ·29	·61	5	10	...	...	...	...
,,		Skipton (Arncliffe)	9·66	+ 2·85	1·63	29	22	...	...	...	...
,,		Hull (Pearson Park).....	3·76	+ 1·49	·67	2	22	54·0	27	21·0	1
X.		Newcastle (Town Moor)	4·60	+ 2·30	·50	27	21	...	...	...	...
,,		Borrowdale (Seathwaite).....	19·27	+ 4·46	4·59	29	23	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	7·59	+ 3·04	·87	27	24	...	...	...	...
,,		Haverfordwest	8·85	+ 3·86	·91	10	29	52·0	7	25·9	18
,,		Aberystwith (Gogerddan) ...	6·16	+ 1·28	·93	6	25	48·0	30	16·0	17
,,		Llandudno.....	4·19	+ 1·23	·89	6	25	55·4	26	29·5	21
XII.	SCOTLAND.	Cargen [Dumfries]	5·86	+ 1·84	·89	29	17	53·0	26	21·6	1
,,		Jedburgh (Sunnyside).....	4·02	+ 1·82	1·50	17	22	52·0	26	18·0	1
XIV.		Colmonell	7·22	...	1·06	29	21	53·0	8	20·0	17*i*
XV.		Lochgilphead (Kilmory).....	8·01	+ ·64	1·19	29	21	...	...	20·0	16
,,		Mull (Quinish).....	6·48	— 1·09	1·00	25	21	...	...	...	...
XVI.		Loch Leven Sluices	6·30	+ 2·99	·90	26	18	...	...	...	...
,,		Dundee (Eastern Necropolis)	5·25	+ 3·17	·70	6	24	54·1	26	28·6	1
XVII.		Braemar	4·51	+ 2·04	·73	4	23	50·8	26	9·3	23
,,		Aberdeen (Cranford)	7·25	...	1·03	6	24	54·0	26	25·0	15
,,		Cawdor (Budgate)	2·80	+ ·34	·48	6	19	...	...	...	...
XVIII		Strathconan [Beauly]	4·31	— 1·46	·81	4	12	...	...	...	...
,,		Glencarron Lodge.....	7·13	...	1·29	30	21	51·6	26	19·0	18
XIX.		Dunrobin	3·88	+ ·51	·77	6	17	51·5	26	28·0	18
,,		S. Ronaldsay (Roeberry).....	5·28	+ 1·62	·90	10	25	48·0	25*d*	29·0	17
XX.	IRELAND.	Darrynane Abbey.....	7·31	...	·90	13	27	...	...	...	...
,,		Waterford (Brook Lodge) ...	8·48	+ 4·84	1·47	8	23	51·5	2*e*	26·0	18
,,		O'Briensbridge (Ross)	6·23	...	·93	25	21	...	...	...	...
XXI.		Carlow (Browne's Hill)	6·82	+ 3·70	1·37	8	23	...	...	...	...
,,		Dublin (FitzWilliam Square)	4·19	+ 2·03	1·39	8	20	57·6	26	27·0	18*g*
XXII.		Ballinasloe	5·76	+ 2·34	·99	29	24	52·0	26	19·0	19
,,		Clifden (Kylemore)	12·35	...	1·82	29	27	...	...	...	...
XXIII		Waringstown	4·82	+ 1·78	·92	27	23	54·0	25	18·0	19
,,		Londonderry (Creggan Res.).	3·99	— ·22	·60	29	26	...	...	...	...
,,		Omagh (Edenfel)	4·57	+ ·89	·74	29	20	50·0	25*f*	14·0	19

+Shows that the fall was above the average ; —that it was below it.

a—and 10. *b*—and 30, 31. *c*—and 28, 30. *d*—and 26. *e*—and 27, 31. *f*—and 29, 30.
g—and 20. *h*—and 24. *i*—and 19.

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METEOROLOGICAL NOTES ON DECEMBER, 1896.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

ADDINGTON.—A wet month, generally mild during the day, except from the 16th to the 22nd. From the 26th to the end, max. temp. rather high. Barometer very low on the 6th; a sprinkling of S on the 17th and 19th; large floods on 5th, 25th and 27th; fogs on 16th, 17th and 23rd.

BURY ST. EDMUNDS, WESTLEY.—S on 18th. The month has been wet and mild, and the past year has been the wettest year except 1872 (with 33·18 in.) in my 40 years' record, which I have now completed.

NORWICH, BRUNDALL.—Damp, gloomy and unsettled during the first fortnight, with rain daily; more seasonable in the third week. The last week stormy; bright and rainy days alternating.

WEYMOUTH, LANGTON HERRING.—The weather almost throughout the month has been very wet and unsettled. The mean temp. (39°·9) was as nearly as possible equal to the average. Stormy weather on the 4th, 5th, 6th and 13th. Fogs on the 21st, 26th and 30th. Lunar halo on the 14th.

TORQUAY, CARY GREEN.—Rainfall 4·09 in. above the average. Mean temp. 42°·8, or 0°·2 below the average. Duration of sunshine 40 hours 30 minutes, being 13 hours below the average; 11 sunless days. The rainfall for the year has been 8·02 in. below the average.

POLAPIT TAMAR [LAUNCESTON].—The wettest December during the past 16 years, the total fall exceeding the average by 2·52 ins.

STROUD, UPFIELD.—Gale on 9th. On 17th, a snowstorm at 2.30 p.m. (S ½-inch deep). Gale at night of 29th.

WOOLSTASTON.—A wet month, with a good deal of frost. Wild gale on the night of the 8th and 9th. S fell lightly on the 18th and 19th.

TENBURY, ORLETON.—A rather wet month, with an unusual amount of wind, temperature about the average. S only once, on the 17th. A cold spell from the 16th to 24th, during which time there was practically no thaw, though on no day did the thermometer remain below 32° all day. Frequent fogs and gales. During the last 65 years we have only had 4 drier ones than 1896—viz., 1844, 1854, 1864 and 1887.

LEICESTER, BARKBY.—A month of frequent rain and very variable Barometrical readings. Mean temp. 37°·5. S on 18th.

MANCHESTER, PLYMOUTH GROVE.—Dense fog on the 16th and 21st. A fall of snow on the 17th. End of the month as mild as May.

ARNCLIFFE.—A wet month, unusually free from snow.

SEATHWAITE.—Very wet from 23rd to 31st, total 14·56 in. 4·59 in. fell on 29th, 2·89 in. on 24th, 2·13 in. on 25th, and more than an inch on 27th and 30th.

WALES.

HAVERFORDWEST.—December commenced cold and gloomy, and much R every day up to the 18th. From the 4th to the 8th was excedingly stormy. On the 5th, from 9 a.m. to 12, the Barometer stood at 29·01 in.; with that exception, from the 5th onward the mercury was below 29 in. for 51 hours. Frost, alternated with storm and rain, during the whole of that period. S covered the Precelly range from the 15th to the 21st. From the 21st to the end, very wet and gloomy, with higher temperature.

ABERYSTWITH, GOGERDDAN.—Very wet throughout, and very little sunshine.

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SCOTLAND.

CARGEN [DUMFRIES].—Very changeable weather has prevailed during the month, the range of Bar. pressure approaching 1½ inches. A sharp spell of frost was experienced between the 16th and 23rd, the mean temp. for those eight days being 30°·5; during the remaining eight days of the month the mean temperature averaged 41°·1. During the nights of the 30th and 31st stiff breezes blew from S.W.; light winds, however—mostly easterly—generally prevailed. Aurora was observed on the 15th, and T was heard on 31st. Sunshine was only registered during 37 hours, and there were 16 entirely sunless days. The unsettled weather has not been favourable to stock wintered out of doors, and sheep folded on turnips have had anything but comfortable quarters; the mild weather experienced during the last few days of the month has, however, freshened up pastures, and farm work generally is well advanced.

JEDBURGH.—The leading feature of the weather has been its variableness, changes often twice a day. Little sun, but little fog; out-door work not much retarded. Little ailment in the community. Pink and white primrose in bloom on 26th; snowdrops appearing above ground 28th; snowdrops and yellow aconite in bloom on 31st.

COLMONELL.—Rainfall 2·26 in. above the average for 20 years. Mean temp. 1°·0 above the average. H on 12th and 15th. S on 15th and 16th.

ABERDEEN, CRANFORD.—The wind has been very light, and foggy weather right through the month, hardly one day bright.

S. RONALDSAY, ROEBERRY.—A very wet, windy month.

IRELAND.

DARRYNANE ABBEY.—Wettest month since November, 1892. Very sharp frost 16th, to morning of the 20th, rest of month rather mild, especially latter part. Very strong gale, force 11 Beaufort scale, for about five hours, on afternoon of 30th. H on 16th.

WATERFORD, BROOK LODGE.—Large Lunar Halo on 12th, S on the Comeragh and Carlow Mountains on 14th.

O'BRIENSBRIDGE, ROSS.—A considerable rainfall, making up for November deficiency. Temp. generally mild, only some light frosts, and of short duration.

DUBLIN.—A generally unsettled, open, rainy month. Mean temp. 41°·4, or 0°·1 above the average. Solar halos on 4th, 13th and 14th; a lunar halo on the 23rd. High winds on 12 days, but attained the force of a gale on only two occasions, the 26th and 30th. Foggy on the 4th, 5th, 11th, 13th, 20th and 22nd. No S or sleet. H on the 9th and 18th. Aurora borealis on the 3rd.

CLIFDEN, KYLEMORE.—The roughest month of the year, with rain, storm, and frost. The flood has been the highest for many years.

WARINGSTOWN.—A wet, mild month, except the third week, when there was a sharp frost.

OMAGH, EDENFEL.—The first fortnight was mild and rainy, with one or two short frosty intervals, the third week fine, clear and frosty, with little or no snow; the temp. on the night of the 18th fell to 14° in the stand, and to 10° on the surface of the ground. A remarkably sudden and complete change took place on the 24th, and the year terminated in persistent and continuous wet.

END OF VOL. XXXI.

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SYMONS'S
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CCCLXXIII.] FEBRUARY, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

WATER AT UNUSUALLY LOW TEMPERATURES.

ON Monday, November 30th, the Observer at Camden Square, having finished the usual 9 a.m. Meteorological readings, reported that the water-supply for the wet bulb thermometer on the Glaisher screen (I.) was not frozen, though the air temperature was 29°·1; and examination showed that the water was absolutely free from ice, though the muslin, and the wick from the edge of the water vessel to it, were frozen. There is on the same screen another hygrometer, the water supply for which was frozen into a solid mass of ice not adhering to the vessel. This second water-vessel, (II.) though more protected from radiation, was more exposed to the wind.

The night had been clear and cold, at 9 a.m. the sky was almost cloudless and the sun shining brightly, but there was a slight accumulation of London smoke in the air, not sufficient to justify the use of the word fog or foggy. The wind was very light from E. or E.N.E. These general conditions of weather continued practically unchanged until noon.

Our immediate impression was that the water in I. remained unfrozen owing to the stillness of the air, and that rapid congelation would take place on the slightest disturbance, but stirring the surface lightly with the point of a cedar pencil produced no result. An unmounted mercurial thermometer was then obtained, and at 9.15 a.m. a series of readings commenced. The temperature of the water was ascertained by immersing the bulb and about an inch of the stem of the thermometer and stirring for 15 or 20 seconds, then reading and again stirring for 15 or 20 seconds, and again reading; if the two readings were not identical, the process was repeated. The bulb of the thermometer was not withdrawn from the water during reading.*

Time	9.0	9.15	9.45	10.0	10.15	10.30	11.0	11.30
Dry bulb ...	29°·1	29°·5	30°·9	31°·8	32°·2	33°·1	34°·6	35°·7
Water in No. I....	—	28·1	29·2	30·0	30·6	31·1	32·5	33·4

* This thermometer is by Casella, No. 19409, graduated on the stem about 15 years ago, bulb 0·23 inch diameter, taking up the true temperature in water in 15 seconds. It was compared with a Kew Standard in water, the error being at 34°·0 + 0°·6. In a drained vessel of broken ice its error was + 0°·7, and this correction has been applied to all its readings.

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The minimum temperature occurred about 5.30 a.m., and was 25°·4, and there appears to be justification for assuming that the water in I. fell to very nearly this temp. without the formation of ice.

It will be seen that the temperature rose gradually, but the other conditions as before described remained unchanged, until at 9.45 a.m. it was found that the muslin and wick were thawed, the temperature of the air being 30°·9 and of the water 29°·2.

At 10.30 a.m. the ice in vessel No. II. was beginning to thaw, and moisture was visible between the ice and the glass, but there was not sufficient to flow.

By 11 a.m. the temperature of the air had risen to 34°·6, and of the water in No. I. to 32°·5, not an atom of ice having been seen in or on the water during the whole time.

Three new unused stoppered glass bottles were obtained, and at 2 p.m. all the water from vessel No. I. was bottled, the remaining ice in No. II. was melted by placing the vessel in warm water in the open air, and the whole of its contents were put into the second bottle, while the third bottle was filled with water from the store of rain water kept for replenishing the vessels I. and II.

This store is an uncorked glass bottle kept standing in the observer's office, which is filled from time to time with the rain caught in a copper rain gauge (thoroughly oxidised) with a copper receiver.

These three bottles—marked "Liquid" (vessel I.), "Frozen" (vessel II.), and "Supply"—were handed to Mr. M. J. Salter, F.I.C., F.C.S., who kindly undertook their chemical examination. From his notes we have extracted the following.

"It seemed to me that the first thing was to try to freeze the sample marked "Liquid," and notice how it behaved. I therefore took an ordinary 6 × $\frac{3}{4}$ inch test tube which had been in use for general work, and after washing it as usual, and finally with distilled water, carefully wiped it dry and polished it inside with a clean cloth. I used this same test tube throughout all the experiments. From the irregular way the water-drops adhered to the glass, I infer that it was slightly greasy. It certainly was not catharised in Tomlinson's sense (*Journ. Chem. Soc.* xxii. 125). Into this I poured enough of the water to cover the stem of the thermometer (your Casella 19409) to about 40°, but in the first freezing experiment I found it inconvenient to have so much water, and therefore for all the others I worked with the surface somewhat below 25°, which allowed me to plunge the water column almost entirely below the surface of the freezing mixture. For the freezing mixture I used ice and salt, with no special precautions as to temperature. The thermometer had a slip of wood tied across it, which just kept its bulb from touching the *bottom* of the test tube (say about $\frac{1}{8}$ inch up). I now employed two methods of observation.

(1) As the falling temperature approached 33° I stirred the

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water continuously with the thermometer, stopping every few seconds just long enough to get a reading.

(2) Leaving the thermometer hanging at rest in the water, I avoided disturbance as completely as possible, and simply watched the course of the mercury.

The following table will now speak for itself.

	Method of observation.	Lowest reading.	
SAMPLE "LIQUID" (*Water from vessel No. I.*).			
	Stirring.	26°·8	At this moment spicules of ice were seen to be adhering to the thermometer, and temp. rose suddenly to 32°·0.
Warmed to 52°	,,	32°·0	Ice formed as soon as 32°·0 was reached.
,, ,, 75°	,,	24°·7	Then suddenly shot up to 32°·0, and most of the sample became solid.
,, ,, 65°	Unstirred.	28°·8	Rose suddenly to 31°·9.
,, ,, 75°	,,	28°·7	,, ,, ,, 32°·0.
SAMPLE "FROZEN" (*Water from vessel No. II.*).			
	Unstirred.	31°·3	Then rose to 31°·8, and a crystal of ice seen.
Remelted.	Stirring.	26°·4	Solidified suddenly, with rise to 32°·0.
Warmed to 47°	,,	27°·7	,, ,, ,, ,, 32°·0.
SAMPLE "SUPPLY" (*Water from store*).			
	Unstirred.	31°·1	At moment, when this reading obtained, it was found that nearly half the water was frozen.
Warmed to 55°	,,	30°·1	Then rose to 31°·8, and most of it found to be solid.
,, ,, 50°	,,	31°·6	Then rose to 31°·8, and most of it found to be solid.

The above show that the solidification is extremely capricious and that this is not due to the presence of any substance in solution which produces an absolute lowering of the freezing point, but is rather to be attributed either to the absence of nuclei, or possibly to the presence of some substance such as tarry matter by which ordinary nuclei are rendered inert. I noticed later on that the samples showed a tendency to form films, as if there was present some substance which increased the surface tension. As far as can be judged from the somewhat negative character of the results with "Supply," it seems that the exposure to a smoky atmosphere in the open glass vessels on the Glaisher screen had increased the tendency to resist freezing.

I next took the specific gravity of the samples at 60° F., using a Sprengel sp. gr. tube, which holds 12·5575 grams of distilled water. This, having been made originally for taking the sp. gr. of oils and varnishes, has rather wide capillaries, so that it is scarcely fit for work of the highest refinement. The results I got, were, however—

"LIQUID"	1·00023.
"FROZEN"	1·00059.
"SUPPLY"	1·00013.

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These numbers are quite sufficient to show that the impurities present are not in sufficient quantity to affect the freezing point, even if the rise of the thermometer to 31°·8—32°·0, as soon as ice began to form did not indicate that 32° was the true freezing point.

The question at issue being one of temperature, refined determination of impurities appeared unnecessary, but—

"LIQUID" showed—Ammonia in considerable quantity with Nessler.

" " Sulphuric acid or a sulphate with barium chloride.

" " Oxidisable organic matter (? sulphurous acid) with permanganate.

" " Non-volatile matters, both organic and mineral, when evaporated on platinum foil.

Comparative observations with distilled water were also made.

A test-tube, with no special cleaning, was employed, and distilled water, neither specially pure, nor quite free from dust.

DISTILLED WATER.

	Method of observation.	Lowest reading.	
	Unstirred.	22°·1	Then rose to 32°·0, and became solid.
Warmed to 40°.	"	25°·3	Then rose suddenly to 32°·0, and whole mass became solid.
	Fresh distilled water from same supply.		
	Unstirred.	17°·3	Thermometer touched and found to be loose, instantly rose to 32°·0, and whole solidified.
	Fresh distilled water from same supply.		
Warmed to 45°.	Unstirred.	12°·3	Then the whole froze with a sort of flash, and temp. rose to 31°·8.
	Tube wiped carefully, and fresh distilled water from same supply.		
	Stirred.	28°·3	Then rose to 32°·1, and changed to ice.

So far the report. Is it generally known that ordinary or distilled water in an open vessel can, with extreme ease, and without any precautions, be cooled nearly 20° F. below freezing point without solidifying? Is 12°·3 F. the lowest to which a mass can be cooled? We can trace no statement on the subject in any book on physics which we have consulted. Prof. Everett, in his translation of Deschanel, tells us that "Despretz has cooled water to —20° C. (—4° F.) in fine capillary tubes, without its freezing, and Dufour has obtained a similar result by suspending globules of water in a liquid of the same specific gravity, with which it would not mix, this liquid being one which had a very low freezing point."

These cases are, however, quite different, the case before us is one of a wine-glassful of water—not of water in "capillary tubes," or individual globules.

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Prof. Atkinson, in his translation of Ganot, says, "The freezing point of pure water can be diminished by several degrees if the water be previously freed from air by boiling, and be then kept in a perfectly still place. In fact, it may be cooled to —15° C. (5° F.) and even lower, without freezing. But when it is slightly agitated the liquid at once solidifies."

In the case reported above, the water had not been "boiled," and far from being "still," had been repeatedly stirred with a black-lead pencil, and with a thermometer bulb.

Lastly, we referred to Larousse's *Grande Dictionnaire* with the following result:—

"A 0° C. l'eau prend l'état solide; on peut cependant, en la protégeant bien contre tout agitation, la refroidir jusq' à —12° C. (10°·4 F.) sans qu'elle se congèle. La moindre secousse détermine alors la congélation immédiate de la masse et la température remonte à 0° C. (32° F.)."

Here again it is pointed out that the least shock will produce immediate congelation; but the water in vessel I. was not merely shaken, but stirred, without freezing, when several degrees below 32° F.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly Meeting of this Society was held on Wednesday evening, the 16th December, 1896 at the Institution of Civil Engineers, Mr. E. Mawley, F.R.H.S., President, in the chair.

Mr. R. H. Curtis read a paper entitled: "An Attempt to Determine the Velocity Equivalents of Wind-Forces estimated by Beaufort's Scale."

For such a comparison to be satisfactory, four conditions are essential:

(1) The observations should be made at an exposed station, where it may reasonably be expected that the full range of wind-force would be experienced.

(2) The station should be provided with an anemometer, the constants of which are known, and which should occupy a position entirely free from purely local disturbing influences.

(3) The estimations of wind-force should be made by an observer of experience, stationed in the same locality as the anemometer, but acting independently of its indications.

(4) There must be available a sufficiently long series of observations to yield reliable mean results.

Of all the records available those for Scilly appeared most nearly to fulfil the above requirements, and that station was adopted as the principal one. Fleetwood and Yarmouth being used as check stations, and also readings of the Dines's tube anemometer, at Holyhead. In all, 10,263 observations at Scilly were dealt with, and

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12,098 at the other stations. The results of the Robinson Anemometers were corrected by the application of the factor appropriate to each instrument, and the readings were further checked by comparison with observations of the tube anemometer. The wind forces estimated by the observers were checked by comparison, with similar estimates made at neighbouring light-ships, or light-houses. The winds from different points of the compass being separately examined to see how far they yielded accordant results.

The values yielded by the Scilly observations are :—

Mean Velocity Equivalents, in miles and tenths, obtained from the observations made with the Robinson Anemometer at Scilly.

Estimated Force by Beaufort's Scale	0	1	2	3	4	5	6	7	8	9	10	11	12
Equivalent Velocity	...	3·9	6·7	9·3	13·5	19·8	26·0	31·7	36·9	43·0	51·5	63·1	...

While those finally adopted by the Author as the result of the whole discussion are :—

Velocity Equivalents for Estimated Forces by Beaufort's Scale.

Beaufort's Scale	0	1	2	3	4	5	6	7	8	9	10	11	12
Equivalent Velocity in miles per hour ...	2	4	7	10	14	19	25	31	37	44	53	64	77
Metres per sec.	0·9	1·8	3·1	4·5	6·3	8·5	11·2	13·9	16·5	19·7	23·7	28·6	34·4

The President remarked that to adopt the new factor for the Robinson's cup anemometer would make a great alteration from the values we were accustomed to see : 105 miles an hour would become 77 miles ; 87 miles, 64 ; 72 miles, 53, and so on.

Mr. Chatterton thought that Mr. Curtis had treated the 1887 results of the Wind Force Committee too politely. The Committee had worked on data based on a fallacious coefficient, and they now found that the exposure of the anemometers was also bad. He hoped that the day had gone by when results of useless observations would continue to be printed at the public expense.

Mr. Dines considered the practice of continuing to use a wrong factor—one that everybody who printed and who read the results knows to be wrong—was indefensible. In early years he had been surprised that the Scilly values were far below those for Holyhead ; but he afterwards found out that the Scilly instrument was not of the standard pattern, and that for it the factor 3 was practically correct.

Mr. Charles Harding believed that the Wind Force Committee had not arrived at an absolute decision as to what is best to be done, and he suggested that no alteration should be made before 1900. If a change were made now, another might be necessary a year or two

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hence. He criticised Mr. Curtis's value of 2 miles an hour for force 0, or dead calm.

Mr. Symons exhibited a diagram showing some eight or ten different determinations of the equivalents of Beaufort scale, and remarked on the wide variation between them.

Mr. Gaster suggested that Mr. Symons's diagram illustrated the necessity for Mr. Curtis's paper. In a calm, light airs from various directions would all act on the anemometer, and cause revolution of the cups. He thought it was often forgotten that the extreme estimates of velocities of 100 or 120 miles an hour, were estimates in terms of West India hurricanes, which no canvas could stand. It must be remembered that the results based on factor 3 *are* printed, and the amount of confusion that would be caused by alteration would be very great.

Mr. Sowerby Wallis considered the paper a final settlement of what the Beaufort Scale means now; but he did not feel sure that it was the same when Admiral Beaufort invented it. Mr. Curtis's values show a steadily increasing increment of velocity for each value of the scale, while some of the earlier determinations—notably Sir H. James's—show a uniform increment. Would it be possible to get, on this point, the opinion of old salts who remembered sailing ships?

Mr. Brodie believed that finality, if not reached, was very nearly approached. In the paper, the Scilly values were treated as nearly perfect; but the observer is an old man, who would probably be soon superseded, and change of observer often results in change of the forces recorded. Estimation should be abolished altogether, by the use of a portable anemometer.

Mr. Ellis found that if Mr. Curtis's figures are taken to one place of decimals they run much better, and agree very closely with a mathematical formula which he had worked out, which gives for force 0, 1·6 miles. He asked whether Mr. Curtis considered the factor as constant for all velocities?

Capt. Carpenter doubted whether officers of the present day had any idea what sail a frigate could carry; but the state of the surface of the sea was a useful aid—the beginning of the formation of "white horses" indicated a wind of force 4. Some portable anemometer would be a great improvement on the use of the Beaufort Scale.

A paper by Dr. Leigh Canney on the "Winter Climate of Egypt" was read by the Secretary. The climate of Egypt during the winter is influenced by the Libyan desert, by the Mediterranean Sea, and by the extent of cultivated land. The author gave the results of a series of observations which he had carried on during the past three winters. The observations were started with the object of arriving at a comparative knowledge respecting the climates of the various stations now considered as health resorts in Egypt, and by a strictly comparable method to arrive at the precise differences between the climates of Upper and Lower Egypt, all previous observations having

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failed in this respect. The stations at which observations were made were Cairo, Helouan, Mena House Hotel, Luxor, Assouan, the Valley of the Tombs of the Kings, and the crest of the Libyan Hills. As self-recording thermometers and hair hygrometers were used at each station, valuable data have been obtained on the diurnal variation of temperature and humidity.

Dr. Marcet considered the paper a very valuable one, but there were one or two points on which he would have liked more information—the treatment of the question of rainfall, for instance, being very slight. Solar radiation temp. also is very important, but difficult to observe, as the sun max. in vacuo seems to be unsatisfactory, but the shade temperatures given in the paper were no guide to the heat to which our soldiers were exposed in the last campaign. The slight fall of temp. at sunset at Luxor was interesting, and he (the speaker) had more than once observed an almost equal rise of temperature. The sensation of chilliness was not felt in Upper Egypt till about 4 hours after sunset, while in Lower Egypt it was felt much sooner.

Dr. Theodore Williams said that the traces exhibited seemed wonderfully uniform at the different stations, and also day after day. It was surprising to see that in the desert, where there is utter absence of vegetation, there is less range of temp. than in the cultivated regions. What struck him most with regard to humidity was, not the lowness of the values, but that in the night the percentage rose at times to 80, and the wonder was where the moisture came from. As regards rainfall in Upper Egypt, there is practically none to record. The position of the instruments on roofs was contrary to English ideas, but it was necessary to get up 40 or 50 ft. to get above the rise of the Nile.

The annual general meeting of this society was held on Wednesday January 20th, at the Institution of Civil Engineers, Great George-street, Westminster, Mr. E. Mawley, President, in the chair. The president delivered an address on "Shade Temperatures," in which he stated that of all meteorological observations there were none approaching in importance those made of the temperature of the air—generally known as shade temperature. Mr. Mawley traced the history of the different methods of exposing thermometers since the time that regular observations of the weather had been made in this country. For many years open screens were most favoured by meteorologists, that devised by Mr. J. Glaisher, F.R.S., and the late Astronomer Royal (Sir G. B. Airy, F.R.S.) being the pattern principally used. In 1864 Mr. T. Stevenson, C.E. invented an admirable form of closed screen with louvred sides, which was considered preferable to the open type of screen, and has now almost entirely superseded the Glaisher stand. In 1883 the Stevenson screen was considerably improved by a committee of the Royal Meteorological Society. Mr. Mawley then described his own experiments at Croydon and Berk-

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hamstead with this improved screen, known as the Royal Meteorological Society's pattern. He advised the general adoption of this form of thermometer exposure, both in this country and on the Continent. He had recently made observations in the Stevenson screen, and also in the screens used in France and Germany, and the conclusion he had come to was that the results obtained in the Stevenson screen were not only the nearest to the true air temperatures, but also more likely to be independent of surrounding conditions than other patterns.

A TORNADO AT ESTE'S PARK, COLORADO.

We have been favoured with the following description, and insert it with the object of ascertaining what foundation there is for the impression that tornadoes are creatures of the plains. Este's Park is (we see by Dr. Theodore Williams's Presidential Address to the Royal Meteorological Society, where it is fully described) 7,500 feet above sea level, so that the average reading of the barometer there must be about 22½ inches or only three-quarters of that in the plains; evidently therefore to produce equal structural damage the velocity of the wind must be much greater. Hence we have three points on which information is desirable, (1) Is it a fact that Tornadoes rarely occur at high altitudes; or (2) Is their force less, and do they thereby escape notice? (3) Are they more rare because the conditions of heat and moisture necessary for their formation do not exist?

Extract from letter by Mr. H. C. Rogers, dated Este's Park, Colorado, Nov. 4th, 1896:—

The place where I am staying is in summer run as an hotel; now another man and I are the only visitors. During the last ten days the weather has not only been cold but made objectionable by a cold west wind. About 4 p.m. to-day a friend, Dr. James, called, and we three were sitting in a room which opens on to a verandah. Suddenly we heard the sound of a terrific rushing wind and the rattle of gravel and debris, the house swayed, the windows were darkened and then suddenly the room was more light than usual. The front of the house consists of two sides of a square, and it is firmly built with a verandah 8 feet deep all round the two sides. On going out we found that about 55 feet of the verandah had been carried away—a few yards, severed from the portion carried away, lay on the ground a heap of splinters, but by far the larger portion had been lifted over the wing of the house and deposited by the river 85 yards away. We have also heard that timbers were seen flying over the Post Office, distant about a quarter-of-a-mile, and they may have been part of our verandah. In seven windows facing the verandah not a pane of glass was broken. The outer door (a sort of door with wire gauze instead of panel) was ripped off its hinges, and is a mass of splinters. The whole performance, from the first sound of the whirl

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until the business was over, could not have been more than five seconds. Just before this a strong blast of wind started up from the east, the opposite direction to that of the strong wind that has prevailed during the last few days—they apparently met near here and took the form of a cyclone. I do not think that it came from any considerable distance, nor do we think that it travelled far, for we could see no trees down or other signs of destruction. This is an extremely rare occurrence at an altitude where the atmosphere is so rarified, and nobody seems to have heard of such a tornado in these mountains before—although of course it is nothing to be compared to what happens at lower elevations out in the plains east of this place, such as occurred at St. Louis not many months ago.

REVIEWS.

Neudrucke von Schriften und Karten . . . . herausg. von Prof. Dr. HELLMANN. Berlin: A. Asher & Co. 4to. 1896.

No. 7.—EVANGELISTA TORRICELLI. *Esperienza dell'Argento Vivo. Accademia del Cimento. Istrumenti per conoscer l'Alterazioni dell'Aria.*

THIS may be described as an essay on the invention and early history of the barometer, thermometer and hygrometer, and is perhaps the most important of this valuable series of works; not on account of the rarity of the works reproduced, for as we have ourselves five or six editions of the "Saggi" of the Accademia, including those of 1666 and of 1841, we can hardly regard it as very rare,* but because of the mass of information which Dr. Hellmann has inserted in the notes. Nothing but careful perusal can do justice to it; but, to take a very low indication of the information concentrated in it, we may mention that we find Dr. Hellmann quoting Greek, Latin, Dutch, English, French, German and Italian.

It is impossible within any ordinary limit to give a fair idea of the research epitomized in this book, the only conceivable complaint seems to us to be that it somewhat breaks down under its own wealth of confirmatory evidence, and gives the feeling of ones having been reading a dictionary rather than a book. No one without thoroughly mastering it must pretend to write the early history of the three instruments we have named, but we think that the "Einleitung" might with advantage have been relieved by some portions being transferred to the "Anmerkungen." As to these Remarks which occupy eight quarto pages, we know no other eight pages which contain so much useful information. Dr. Hellmann on

* A reference to the superb glass work of the Florentines in the middle of the 17th century, and an engraving of one of their thermometers, will be found on p. 91 of Vol. XI. (1876) of the *Met. Mag.*

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p. 20 points out the desirability of an accurate comparison of the Florentine thermometer at the Royal Institution, with a standard; and we trust that that may soon be done.

No. 8.—E. HALLEY, A. VON HUMBOLDT, E. LOOMIS, U. J. LE VERRIER, E. RENOU. *Meteorologische Karten*, 1688, 1817, 1846, 1863, 1864.

SIX facsimile maps which Dr. Hellmann happily describes as milestones on the road of meteorological progress. Halley's Map of the Winds, Humboldt's first Isothermal Chart, Loomis's Storm Map, Early Isobaric Charts by Le Verrier (or possibly by Marié Davy?) and Renou's Map of the Mean Isobars for France—this is the interesting set reproduced in No. 8. And there is of course the usual introduction and bibliography by Dr. Hellmann of a quality which no living man can equal, and from which one always learns something. For instance, we recently reproduced the first weather map, sold in the 1851 Exhibition; Dr. Hellmann gives us a paragraph in Dutch from a work by Dr. Buijs Ballot which shows that it was through seeing these maps that he was led to publish analogous ones in the Nederlandsch Meteorol. Jaarboek für 1852.

On another page Dr. Hellmann mentions that he possesses the first of a series of a sort of synoptic weather maps for November, 1725, by an unknown author residing at an unknown place, which bear the title "Erster Entwurf einer Witterungs-Charte darinne die Witterung wie man sie an verschiedenen Oerthern Teutschlandes in einem District von etlichen 80 Meilen lang und 60 Meilen breit, im Monath Novembr., 1725, beobachtet, vorgestellet wird."

No. 9.—HENRY GELLIBRAND. *A Discourse Mathematical on the Variation of the Magneticall Needle. London*, 1635.

A FACSIMILE reproduction of the copy of the above rare tract belonging to Mr. Latimer Clark, F.R.S. The first comparisons between the true terrestrial meridian and the magnetic meridian were made by Burrowes at Limehouse, Oct. 16, 1580, when he found it about 11° 16′ E. On June 13, 1622, Mr. Gunter at the same place found it to be about 5° 56′ E., but it does not seem to have occurred to him that this difference showed any secular change, and therein lies the merit of Gellibrand's paper in that he not merely determined the variation at Deptford on June 12, 1634, to be only 4° 4′ E., but pointed out the decrease of about 7° in 54 years.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, AUGUST, 1896.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	77·1	13	45·4	27	69·9	51·6	54·0	83	123·9	40·1	1·92	14	5·8
Malta	104·8	11	59·4	31	86·6	71·0	66·2	68	152·0	52·9	·00	0	2·2
Mauritius	75·0	7	58·6	8	72·6	63·2	57·2	71	121·9	47·3	2·08	16	5·0
Calcutta	89·8	28	75·6	3	87·6	78·7	78·2	87	157·7	75·1	11·02	21	7·7
Bombay	86·1	25	75·0	11	83·6	76·6	75·4	86	142·8	72·3	20·77	29	8·8
Ceylon, Colombo	88·0	15	73·3	4	85·4	77·3	73·2	80	145·0	70·0	6·35	15	6·1
Melbourne	67·2	22	35·8	2	56·6	42·4	43·1	74	118·0	24·8	2·75	14	6·8
Adelaide	71·7	22	37·7	3	61·3	44·1	42·5	72	130·1	29·3	1·23	15	6·3
Sydney	67·7	23	40·5	1	59·2	45·7	43·9	81	117·7	29·8	1·78	12	3·4
Wellington	60·0	25	34·0	5*b*	53·7	42·0	40·0	75	116·0	21·0	3·63	17	4·6
Auckland	64·0	31	38·0	11	57·2	46·3	42·8	73	121·0	32·0	3·65	...	5·4
Jamaica, Kingston	91·8	19*a*	70·4	22	90·7	74·1	70·7	71	...	...	·40	5	...
Trinidad	91·0	19	68·0	9	88·4	71·7	74·2	84	176·0	67·0	7·66	20	...
Grenada	86·2	8	72·2	15	83·3	74·7	70·7	73	148·4	...	8·81	23	3·9
Toronto	89·9	4	42·3	20	79·2	56·6	57·9	70	107·0	37·0	1·13	9	4·7
New Brunswick, Fredericton	92·7	11	40·3	31	76·6	51·4	54·0	66	...	...	1·10	11	4·1
Manitoba, Winnipeg	84·6	7	32·0	31	74·8	48·0	...	...	...	...	1·51	11	4·7
British Columbia, Esquimalt	73·7	6	46·2	11	68·3	50·9	53·5	85	...	...	·57	5	6·3

a—and 23. *b*—and 6, 10.

REMARKS.

MALTA.—Adopted mean temp. 77°·7, or 0°·5 below the average. Mean hourly velocity of wind 9·4 miles. Average temp. of sea 79°·0. TS on 28th. Absolute max. the highest reading recorded in 13 years, while the absolute min. is the lowest for August. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·3, dew point 2°·0, and rainfall ·19 in., below, their respective averages. Mean hourly velocity of wind 12·5 miles, or 0·2 above average; extremes, 28°·6 on 1st, and 2·3 on 10th and 11th; prevailing direction, E.S.E. T. F. CLAXTON.

CEYLON, COLOMBO.—Lightning was seen on the 18th, 19th and 26th. F. W. GRIMLINTON.

Adelaide.—Mean temp. 1°·3, and rainfall 1·14 in., below the average for 39 years. The winter throughout South Australia has been very dry. C. TODD, F.R.S.

Sydney.—Rainfall 1·04 in. below, humidity 7°·7 above, and temperature 2°·5 below, their respective averages. This month was remarkable for the number of cloudless nights, hence dew was measured on 13 days amounting to ·065 in. The average max. is the lowest since 1861. H. C. RUSSELL, F.R.S.

Wellington.—The first part of the month was generally fine, with occasional showers and light winds, the middle showery, then fine weather until the end, when it was showery and unsettled. S on the hills during the latter part of the month. H on 8th and 17th. Fog on 6th. R. B. GORE.

Auckland.—Weather warm and mild during the greater portion of the month. Barometrical pressure and mean temp. both considerably above the average. Rainfall considerably below. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 2·66 in. below the 30 years average. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, JANUARY, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
II.	Dorking, Abinger Hall .	2·96	XI.	Lake Vyrnwy	1·81
,,	Birchington, Thor	2·34	,,	Corwen, Rhug	1·78
,,	Hailsham	2·68	,,	Criccith, Talarvor.....	1·60
,,	Ryde, Thornbrough	2·87	,,	I. of Man, Douglas	2·53
,,	Emsworth, Redlands ...	2·87	XII.	Stoneykirk, Ardwell Ho.	1·65
,,	Alton, Ashdell	2·28	,,	New Galloway, Glenlee	2·99
III.	Oxford, Magdalen Col..	1·79	,,	Lilliesleaf, Riddell	1·38
,,	Banbury, Bloxham	2·00	XIII.	N. Esk Res. [Penicuick]	2·35
,,	Northampton, Sedgebrook	2·49	,,	Edinburgh, Blacket Pl..	·80
,,	Duddington [Stanford]..	2·21	XIV.	Glasgow, Queen's Park..	1·22
,,	Alconbury	1·94	XV.	Inverary, Newtown	1·48
,,	Wisbech, Bank House...	1·76	,,	Oban, The Corran	1·15
IV.	Southend	2·29	,,	Islay, Gruinart School...	1·09
,,	Harlow, Sheering..... ...	2·27	XVI.	Dollar.....	1·88
,,	Colchester, Lexden	2·09	,,	Balquhidder, Stronvar...	2·54
,,	Rendlesham Hall	2·34	,,	Ballinluig	1·68
,,	Rushall Vicarage	1·87	,,	Dalnaspidal H.R.S.....	3·03
,,	Swaffham	1·62	XVII.	Keith H.R.S.....	·64
V.	Salisbury, Alderbury ...	2·42	,,	Forres H.R.S.	1·22
,,	Bishop's Cannings	2·18	XVIII.	Fearn, Lower Pitkerrie..	·96
,,	Blandford, Whatcombe .	2·49	,,	N. Uist, Loch Maddy ...	2·18
,,	Ashburton, Holne Vic...	4·09	,,	Invergarry.....	1·35
,,	Okehampton, Oaklands.	3·27	,,	Aviemore H.R.S.	1·72
,,	Hartland Abbey	2·08	,,	Loch Ness, Drumnadrochit	1·66
,,	Lynmouth, Glenthorne.	2·78	XIX.	Invershin	1·66
,,	Probus, Lamellyn	4·15	,,	Scourie	1·78
,,	Wellington, The Avenue	2·22	,,	Watten H.R.S.....	1·45
,,	Wincanton.....	1·99	XX.	Dunmanway, Coolkelure	5·73
VI.	Clifton, Pembroke Road	1·90	,,	Cork, Wellesley Terrace	4·00
,,	Ross, The Graig	2·42	,,	Killarney, Woodlawn ...	3·72
,,	Wem, Clive Vicarage ...	2·27	,,	Caher, Duneske	2·67
,,	Cheadle, The Heath Ho.	1·85	,,	Ballingarry, Hazelfort...	2·04
,,	Worcester, Diglis Lock	1·93	,,	Limerick, Kilcornan ...	1·74
,,	Coventry, Kingswood ...	2·43	,,	Broadford, Hurdlestown	1·50
VII.	Grantham, Stainby	2·66	,,	Miltown Malbay	2·57
,,	Horncastle, Bucknall ...	2·25	XXI.	Gorey, Courtown House	2·93
,,	Worksop, Hodsck Priory	2·37	,,	Athlone, Twyford	1·92
,,	Neston, Hinderton	1·25	,,	Mullingar, Belvedere ...	2·40
VIII.	Southport, Hesketh Park	·97	,,	Longford, Currygrane...	1·85
,,	Broughton-in-Furness ...	1·54	XXII.	Woodlawn	2·19
IX.	Ripon, Mickley.....	1·73	,,	Crossmolina, Enniscoe ..	2·70
,,	Melmerby, Baldersby ...	1·75	,,	Collooney, Markree Obs.	2·12
,,	Scarborough, Obs.	2·66	,,	Ballinamore, Lawderdale	2·03
,,	Middleton, Mickleton ...	1·31	XXIII.	Lough Sheelin, Arley...	1·60
X.	Haltwhistle, Unthank...	1·11	,,	Warrenpoint.....	2·79
,,	Bamburgh	1·86	,,	Seaforde.....	2·22
,,	Keswick, The Bank.....	1·20	,,	Belfast, Springfield	2·11
XI.	Llanfrechfa Grange	2·53	,,	Bushmills, Dundarave..	1·86
,,	Llandovery	2·24	,,	Stewartstown	1·38
,,	Castle Malgwyn	3·03	,,	Killybegs	2·43
,,	Builth, Abergwesyn Vic.	2·66	,,	Lough Swilly, Carrablagh	1·21
,,	Rhayader, Nantgwillt...	2·70			

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JANUARY, 1897.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]		RAINFALL.				Days on which ·01 or more fell.	TEMPERATURE.				No. of Nights below 32°.	
			Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours			Max.		Min.			
					Dpth	Date		Deg.	Date	Deg.	Date.	In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·05	+ ·43	·83	8	20	47·0	10	23·4	18	15	2
II.		Maidstone (Hunton Court)...	2·22	+ ·67	·50	7	12	...	...	...	...	...	...
,,		Strathfieldsaye	2·44	...	·57	8	12	...	...	...	...	...	...
III.		Hitchin	2·25	+ ·71	·78	8	18	44·0	6	23·0	23*c*	25	...
,,		Winslow (Addington)	2·04	+ ·23	·57	8	20	48·0	7	17·0	18	21	2
IV.		Bury St. Edmunds (Westley)	1 99	+ ·52	·43	16	16	47·0	1	22·0	24	...	...
,,		Norwich (Brundall)	2·44	...	·49	16	26	45·0	1,10	22·0	26	21	2
V.		Weymouth(LangtonHerring)	1·95	— ·39	·54	7	15	49·0	10	22·5	24	15	...
,,		Torquay (Cary Green)	2·48	...	·73	7	16	50·1	11	24·0	24	11	1
,,		Polapit Tamar [Launceston]..	3·06	+ ·04	·67	29	15	51·3	10	18·5	18	18	2
VI.		Stroud (Upfield)	2·40	+ ·20	·43	8	15	47·0	7	21·0	23	21	...
,,		ChurchStretton(Woolstaston)	2·29	+ ·13	·41	8	20	43·5	7	21·0	23*d*	24	3
,,		Tenbury (Orleton)	2·15	+ ·01	·47	8	18	47·5	7	21·3	18	15	2
VII.		Leicester (Barkby)	1·44	— ·32	·26	7	20	44·0	1	12·0	17	24	3
,,		Boston	1·91	+ ·52	·43	8	18	47·0	6	22·0	26	20	...
,,		Hesley Hall [Tickhill].....	2·39	+ ·62	·66	7	21	43·0	1	20·0	24	24	...
VIII.		Manchester(PlymouthGrove)	1·00	— 1·46	·30	4	10	43·0	5, 6	18·0	23	21	2
IX.		Wetherby (Ribston Hall) ...	·87	— 1·02	·32	8	8	...	...	...	...	...	...
,,		Skipton (Arncliffe)	2·40	— 3·24	·47	4	15	...	...	...	...	...	...
,,		Hull (Pearson Park).....	1·85	+ ·08	·30	7, 14	19	49·0	1	21·0	26	22	2
X.		Newcastle (Town Moor)	2·09	+ ·28	·63	7	20	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	2·20	— 9·98	·55	3	11	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	2·26	— 1·03	·45	31	15	...	...	...	...	...	...
,,		Haverfordwest	3·40	— 1·02	·67	3	19	50·9	1	19·6	17	12	1
,,		Aberystwith (Gogerddan) ...	1·38	— 2·15	·25	26*a*	10	48·0	7	11·0	16*e*	25	...
,,		Llandudno.....	1·45	— ·83	·32	30	16	50·2	1	24·4	22	...	...
XII.	SCOTLAND.	Cargen [Dumfries]	1·24	— 2·53	·36	7	8	47·4	1	16·0	18*f*	19	...
,,		Jedburgh (Sunnyside).....	...	...	...	...	...	...	...	...	...	...	...
XIV.		Colmonell	1·70	...	·45	29	9	48 0	3	18 0	23	...	...
XV.		Lochgilphead (Kilmory).....	1·80	— 4·34	·30	25	12	...	...	20·0	14	21	...
,,		Mull (Quinish).....	1·56	— 4·11	·80	4	10	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·90	— 1·00	·50	8	9	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·75	— ·22	·40	30	16	48·1	1	22·3	25	21	...
XVII.		Braemar	1·76	— ·93	·22	9	20	48·3	7	13·4	23	24	3
,,		Aberdeen (Cranford)	3·18	...	·94	30	27	44·0	1, 2	20·0	16	21	...
,,		Cawdor (Budgate)	1·58	— ·59	·65	30	11	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	1·70	— 3·18	·65	8	5	...	...	...	...	...	...
,,		Glencarron Lodge.....	2·05	...	·40	24	17	49·3	2	19·1	17	24	...
XIX.		Dunrobin	1·36	— 1·10	·50	30	8	48·3	3	23·8	25	20	...
,,		S. Ronaldsay (Roeberry).....	1·43	— 1·52	·21	26	22	46·0	2	24·0	25	20	...
XX.	IRELAND.	Darrynane Abbey.....	3·17	...	·56	29	22	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	3·44	— ·12	·60	6	16	50·0	3	20·0	18	16	...
,,		O'Briensbridge (Ross)	1·74	...	·57	31	13	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	2·55	— ·35	·46	5	18	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·69	+ ·83	·58	6	17	51·3	3	25·0	17	13	2
XXII.		Ballinasloe	2·01	— 1·07	·41	29*b*	16	48·0	2	23·0	16	15	...
,,		Clifden (Kylemore)	4·64	...	1·18	29	17	...	...	...	...	...	...
XXIII		Waringstown	2·26	— ·39	·57	29	15	48·0	2	16·0	16	23	2
,,		Londonderry (Creggan Res.).	1·61	— 1·81	·41	29	19	...	...	...	...	...	...
,,		Omagh (Edenfel)	1·55	— 1·47	·44	29	15	48·0	2	17·0	16	18	2

+Shows that the fall was above the average ; —that it was below it.

a—and 31. *b*—and 31. *c*—and 26. *d*—and 24. *e*—and 17. *f*—and 24.

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METEOROLOGICAL NOTES ON JANUARY, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

HITCHIN.—A very cold month. There have not been such S drifts, or so many roads blocked, since April, 1876.

ADDINGTON.—Rain and S on a good many days. The 23rd was a very wild day, a high wind blowing the S of the previous night into great drifts, blocking some of the roads in the district. From the 16th to the end the temp. was low, the average max. being only 35°, and the average min. of the same time 25°. Foggy on three days.

BURY ST. EDMUNDS, WESTLEY.—The month was mild till the 16th, then much S and winterly weather till the end. The snow was heavily drifted in some places, and a snow plough was very useful. S on 8 days.

NORWICH, BRUNDALL.—A rough, winterly month, with much snow during the second half. Strong gales with blinding S storms occurred on the 22nd and 23rd, and the drifts exceeded any in these parts since January, 1881. Mean temp. about 3° below average. Range of temp. unusually small. Winter aconite in flower on 1st, snowdrop on 9th, and crocus on 14th; all unusually early. Aurora on 2nd; fog on 5th; H on 14th. S on the ground from 17th to 31st inclusive.

WEYMOUTH, LANGTON HERRING.—With the exception of the 2nd, the first fourteen days were mild. From the 4th to the 12th there was a good deal of wet and fog. On the 15th the weather became much colder, and remained cold to the end of the month. The mean temp. at 9 a.m. (35°·8) is 2°·8 below the average of 25 years. Very little snow fell, and it never quite covered the ground. Fogs on 4 days.

TORQUAY, CARY GREEN.—Rainfall ·76 in. below the average. Mean temp. 39°·0, or 2°·6 below the average. Duration of sunshine 59 hours 55 minutes, being 7 hours 35 minutes below the average; twelve sunless days.

POLAPIT TAMAR [LAUNCESTON].—A cold, seasonable month, and, though rather wet during the first week and the last four days, the total rainfall is less than the average. Thick fog till 10.30 a.m. on 11th. Squally, with S, about 4.30 p.m. on 22nd, and S for 20 minutes at 2.30 p.m. on 23rd.

STROUD, UPFIELD.—Severe S storm from N.W. on 22nd, when about three-quarters of an inch fell; S also on 9th, 21st, 25th, 27th, 30th, and 31st.

WOOLSTASTON.—A severe month, with continued frost. S fell lightly on 9 days, but there was no heavy fall. Mean temp. 32°·7.

TENBURY, ORLETON.—A very cold, dismal month, with a mean temp. more than 3°·5 below the average of 36 years. No intense cold, but a succession of slight night frosts, with cloudy days. From the 4th to the 13th neither sun, moon, nor stars were ever visible. S on 9 days.

LEICESTER, BARKBY.—A cold month, especially so during the latter half. Very little sunshine. About 4 inches of S. Mean temp. 33°·1.

MANCHESTER, PLYMOUTH GROVE.—Mean temp. 34°·0—the lowest for January since observations commenced in 1868, with the exception of 1871, 1879, and 1881; and the driest January since 1868, with the exception of 1880, 1881, and 1896. Slight falls of S on the 9th and 19th; S storm on the 22nd; and S on 24th, 25th, 26th, and 29th. Dense fog on the 11th, 18th, and 19th. The last ten days very winterly.

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WALES.

HAVERFORDWEST.—January commenced fine, but on the 3rd it became gloomy, wet, and stormy, and continued so until the 13th, when the sky cleared, the wind veered to N.E., and a fine, bright, frosty period set in, which lasted until the 22nd, when S fell, and again on 25th, covering the Precelly range. Afterwards the wind shifted to N.W., with heavy S and H showers, and cold, precarious weather prevailed to the end.

ABERYSTWITH, GOGERDDAN.—S fell on the 26th, 27th, and 28th to a depth of about three inches.

SCOTLAND.

CARGEN [DUMFRIES].—Although no very sudden fluctuations of temp. occurred during the month, which was uniformly cold, there was considerable difference in the mean temp. of the last 19, as compared with the first 12, days. From 1st to 12th, when the thermometer was only once below freezing point, the mean temp. was 38°·4; from 13th to 31st, when frost was registered on every day except 20th, the mean was 31°·8. The mean for the month is 3°·5 below the average of 38 years. The rainfall (of which upwards of ·50 in. fell in the form of S) shews a great deficiency from the average, and is one of the lowest on record; only in the years 1880 and 1881 was less recorded. Owing to the continued frost, curlers had a merry time, but little progress was possible with farm work. S on 16th, 2½ inches deep; on the 24th, 2 inches; and on the 29th, 2½ inches.

COLMONELL.—Rainfall 2·99 in. below the average of 20 years. Mean temp. 1°·4 below the average.

BRAEMAR.—A month of dreary, unsettled weather.

ABERDEEN, CRANFORD.—Gale of wind from the N. and a heavy snowstorm on the 26th, 27th, and 28th.

S. RONALDSAY, ROEBERRY.—A very good month, although cold, until the 24th, when a very severe S storm came on, which continued to the end of the month. Mean temp. 35°·5; 2°·5 below the average of 7 years.

IRELAND.

DARRYNANE ABBEY.—Rainfall below the average. Sharp frosts during the third week, with H, and a few flakes of S on 26th.

WATERFORD, BROOK LODGE.—S on 15th, 17th, 22nd and 23rd. Mean temp. 37°·9.

O'BRIENSBRIDGE, ROSS.—R much under the average. Many fine and bright days in the middle of the month, with slight frosts.

DUBLIN.—Opening with a brilliantly fine day, January, 1897, proved a cold, changeable month. Between the 3rd and the 10th, inclusive, there was an abundant rainfall, with S.E. winds; the weather was open at this time, but after the 14th, frequent frosts occurred, and S fell from time to time. Mean temp. 38°·1, or 3°·3 below the average. Foggy on 9 days. High winds on 11 days, reaching the force of a gale on 4 days. S or sleet fell on 5 days, and H on 5 days.

CLIFDEN, KYLEMORE.—Stormy weather on 1st, 5th, 7th and 29th; strong east gale on 6th. S showers on 26th.

OMAGH, EDENFEL.—The polar, or easterly winds, which prevailed almost without intermission during the month, resulted in weather which may be called of sub-acute severity, for although it froze on 27 nights, sometimes severely, on no day was a temperature of freezing maintained throughout. There was a deficient rainfall, and little or no snow.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXIV.] MARCH, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

SUNSHINE AT KIMBERLEY, S. AFRICA.

THE numbers given below represent the results of three years' (1894-96) observations on the duration of sunshine, taken at the Meteorological Observatory maintained by the De Beers' Company at Kenilworth, near Kimberley. They may possibly interest your readers, since in magnitude they cannot be surpassed by many stations on the earth's surface. In fact one almost gets tired of the perpetual brightness of the sky, and longs for the too-much maligned "leaden" sky of England, of which, as will be seen from the tables, we get only a fortnight's experience in three years.

The quantities for each hour are expressed in minutes, only the monthly and yearly totals being reduced to hours. The number of rainy days, and the amount of rainfall, are put in for comparison. Under the heading "No. of days" will be seen two columns of numbers: the first of these gives the number of days on which a measurable quantity fell, the second all days on which any rain fell. The amounts of rain too small to measure are written ·000, in accordance with the custom followed in Natal.

Of course three years is too short a period for fruitful discussion. It is, however, perhaps worth while to point out that if the sequences hold good for ten or twenty years, then the greater the rainfall the later the hour of maximum sunshine. Attention may be called also to the winter sunshine, particularly, for example, that of July, 1896, where between the hours of X. and XI. only eight minutes of cloudy sky were registered. Indeed for that same hour, the record is only broken for ten minutes from June 17th to August 6th (inclusive)—fifty days.

The instrument used is a Jordan Photographic Recorder, by Negretti & Zambra, of the twin semi-cylinder pattern. The record is measured after a development (for as near as possible fifteen minutes) in rain water—that is, when rain water can be obtained. When there is no rain water, river (Vaal) or spring water has to be used. I do not fancy that the different waters make any difference in the result. River and spring waters certainly bleach the charts

(*Continued on page* 20.)

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Kimberley Sunshine, 1894 *and* 1895. *Taken with a Jordan Recorder* (*twin semi-cylinder pattern*).

	V	VI	VII	VIII	IX	X	XI	NOON	I	II	III	IV	V	VI	VII	Month		Rainfall.		
1894.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	hours.	mins	No. of days without Sunshine.	No. of days		Inches.
Jan.	614	1234	1258	1434	1334	1327	1393	1447	1478	1355	1228	1154	1030	490	279	36	2	13	14	7·29
Feb.	113	763	854	911	906	970	1008	1059	999	1085	975	837	702	142	188	44	3	10	11	5·35
March	9	1098	1494	1477	1526	1539	1398	1375	1197	1159	1170	1175	818	1	257	16	1	14	15	2·32
April	...	607	1563	1522	1550	1654	1628	1497	1577	1468	1517	1456	526	...	276	5	...	7	7	1·57
May	...	85	1490	1485	1508	1501	1514	1443	1463	1396	1338	1178	35	...	240	36	1	7	7	·93
June	...	...	1223	1560	1573	1646	1679	1636	1663	1731	1727	1213	...	...	260	51	...	2	2	·06
July	...	...	1261	1755	1746	1749	1774	1755	1742	1793	1734	1272	...	...	276	21	...	...	0	·00
Aug.	...	193	1508	1679	1642	1664	1745	1743	1730	1721	1691	1456	163	...	282	15	...	1	3	·28
Sept.	...	608	1356	1523	1622	1629	1660	1634	1608	1527	1498	1588	732	...	283	5	...	5	5	·27
Oct.	94	1285	1493	1543	1521	1565	1532	1517	1514	1505	1387	1352	1186	75	292	49	...	8	10	·67
Nov.	522	1443	1609	1615	1690	1722	1699	1590	1617	1387	1283	1216	1263	484	319	0	...	8	10	3·25
Dec.	732	1463	1517	1530	1607	1548	1518	1475	1438	1414	1298	1246	1165	655	310	6	...	9	14	2·52
Totals...	2,084	8,779	16,626	18,034	18,225	18,514	18,548	18,171	18,026	17,541	16,846	15,143	7,620	1,847	3266	44	7	84	98	24·51
1895.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	hours.	mins	No. of days without Sunshine.	No. of days		Inches.
Jan.	734	1513	1639	1644	1644	1631	1575	1534	1381	1418	1443	1311	1283	591	322	21	...	8	12	·93
Feb.	243	1094	1193	1231	1304	1316	1375	1351	1247	1275	1172	1024	946	236	250	7	1	14	16	3·53
March	13	753	1187	1209	1343	1188	1222	1196	1139	1210	1171	1042	760	5	223	58	...	14	19	1·94
April	...	417	1184	1420	1496	1456	1459	1306	1435	1424	1305	1151	382	...	240	35	1	11	11	3·46
May	...	45	1248	1598	1727	1770	1730	1696	1744	1696	1654	1355	96	...	272	39	...	7	7	1·30
June	...	2	1257	1656	1695	1721	1729	1773	1730	1739	1721	1188	...	...	270	11	...	...	1	·00
July	...	...	1140	1568	1744	1785	1732	1690	1717	1677	1715	1109	3	...	264	40	...	1	1	·21
Aug.	...	114	1462	1712	1808	1761	1766	1789	1798	1761	1713	1500	212	...	289	56	...	...	1	·00
Sept.	...	784	1586	1683	1715	1676	1694	1662	1722	1702	1600	1613	835	...	304	32	...	1	2	·02
Oct.	36	1242	1551	1621	1715	1709	1584	1488	1558	1582	1469	1510	1244	52	306	1	...	4	6	·08
Nov.	361	1391	1416	1389	1407	1425	1358	1429	1347	1439	1350	1265	1148	310	283	55	1	10	10	1·79
Dec.	651	1380	1594	1623	1571	1543	1515	1423	1450	1359	1203	1302	1325	562	308	1	...	11	14	2·34
Totals...	2,038	8,715	16,457	18,354	19,169	18,981	18,739	18,337	18,268	18,282	17,516	15,370	8,234	1,756	3336	56	3	81	100	15·60

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Kimberley Sunshine, 1896. *Taken with a Jordan Recorder (twin semi-cylinder pattern).*

	V	VI	VII	VIII	IX	X	XI	NOON	I	II	III	IV	V	VI	VII	Month.		Rainfall.		
1896.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	mins.	hours.	mins	No. of days without Sunshine.	No. of days		Inches.
Jan.	478	1374	1450	1583	1549	1565	1550	1521	1410	1336	1231	1113	967	421	292	28	...	11	14	1·48
Feb.	184	1245	1335	1391	1343	1411	1370	1262	1191	1199	1270	1105	990	173	257	49	...	7	13	·98
March	10	1033	1458	1444	1506	1534	1494	1436	1356	1220	1258	1024	578	9	256	0	...	14	18	2·74
April	...	300	1290	1343	1433	1415	1409	1381	1483	1359	1256	1176	256	...	235	1	2	11	12	2·98
May	...	...	1097	1450	1547	1613	1523	1574	1653	1623	1538	1168	13	...	246	39	...	7	9	2·25
June	...	...	862	1390	1405	1417	1358	1431	1438	1483	1349	740	...	...	214	33	1	6	8	·56
July	...	5	1323	1785	1840	1852	1831	1831	1850	1829	1747	1194	7	...	284	54	...	...	...	...
Aug.	...	131	1331	1545	1586	1711	1709	1661	1670	1621	1536	1182	95	...	262	58	...	4	4	·43
Sept.	...	632	1613	1713	1710	1691	1690	1680	1633	1621	1650	1589	527	...	295	49	...	...	2	·00
Oct.	45	1291	1597	1745	1750	1701	1620	1609	1562	1454	1394	1334	937	38	301	17	...	4	7	·25
Nov.	342	1236	1351	1455	1516	1479	1382	1453	1450	1283	1311	1102	1055	272	278	7	...	10	11	·98
Dec.	530	1181	1120	1254	1453	1425	1291	1206	1097	1026	986	939	828	301	243	57	1	16	17	8·42
Totals...	1,589	8,428	15,827	18,098	18,638	18,814	18,227	18,045	17,793	17,054	16,526	13,666	6,253	1,214	3169	32	4	90	115	21·07

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more; but rain water gives them a much cleaner and brighter appearance.

The exposure is good. The horizon is scarcely broken, save here and there by a "tailings" heap and a few inevitable gum trees. These last though are not of much account, since they tend to turn their leaves edgewise to the sun, and throw very little shadow.

No correction has been made for refraction, or for the want of actinic power in the sunlight when the sun is low and the atmosphere more or less dusty.

The rain-guage is an eight-inch, of the Meteorological Office pattern, mounted with its rim three feet above ground, the receiving chamber being protected from the rays of the sun by a stout wooden box.

Our position is—

Lon. 24° 27′ E. Lat. 28° 42′ S.

Altitude about 3,900 feet.

J. R. SUTTON, B.A.

The Kenilworth Observatory, Kimberley, S. Africa.

Mr. W. Ellis, F.R.S., has very kindly calculated the percentage of the possible duration, which the results given in the foregoing tables represent :—

Kimberley.—Percentage of Sunshine.

	1894.		1895.		1896.
January	66	.....	76	.....	69
February	52	.....	69	.....	68
March	68	.....	59	.....	68
April	81	.....	71	.....	69
May	73	.....	83	.....	75
June	84	.....	87	.....	69
July	85	.....	82	.....	88
August	82	.....	85	.....	77
September	79	.....	85	.....	83
October	74	.....	77	.....	76
November	79	.....	70	.....	69
December	72	.....	72	.....	57
The Year	74	.....	76	.....	72

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THE TEMPERATURE OF FEBRUARY, 1897.

THE weather of the latter part of February, 1897, was marked by unusual and almost unprecedented mildness, and we have searched our own record at Camden Square, which now extends over nearly 40 years, for comparable periods in the past.

Taking the month as a whole we find nothing very exceptional:—

The mean 9 a.m. temp., 42°·6, has been exceeded in 6 years, the highest being 45°·8 in 1869.

The absolute max., 58°·0, has been exceeded in 7 years, the highest being 62°·5 in 1868,

The average max., 48°·4, has been exceeded in 8 years, the highest being 51°·7 in 1869.

The absolute min., 27°·9, has been exceeded in 6 years, the highest being 31°·4 in 1872.

The average min., 39°·0, has been exceeded in 3 years, the highest being 40°·6 in 1869.

From the above we see that the month, notwithstanding its being decidedly warm, shows no very exceptional value, though the average min. is as high only once in 13 years.

Turning now to the warm period towards the end of the month, we find that for ten consecutive days, from 18th to 27th, the absolute max. was 50° or higher, For 8 consecutive days, from 19th to 26th, the 9 a.m. and 9 p.m. temperatures were above 45°, and for the 8 days, 20th to 27th, the min. were above 40°, while for the 9 consecutive days, 19th to 27th, the mean temp. was 48°·2, and above 45° each day.

The following table gives the readings and the means for this period :—

TABLE I.—*Shade Temperature at Camden Square, London, February 19th to 27th, 1897.*

DATE.	9 A.M.	9 P.M.	MAX.*	MIN.	MEAN 9 A.M. 9 P.M. M. and m.
	°	°	°	°	°
19th	46·4	48·9	50·1	39·3	46·2
20th	47·2	46·3	53·7	46·2	48·4
21st	45·6	46·2	51·6	43·6	46·7
22nd	50·1	51·8	57·0	44·6	50·9
23rd	45·1	46·6	53·4	44·3	47·4
24th	46·7	46·7	50·0	45·3	47·2
25th	48·4	50·4	52·2	46·1	49·3
26th	51·9	48·2	58·0	48·4	51·6
27th	44·8	42·0	52·8	43·8	45·8
Average ...	47·4	47·5	53·2	44·6	48·2

* The Max. Temp. on the 18th was 53° 3.

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The conditions shown in this table are far eclipsed by 1869, when from Jan. 28th to Feb. 17th—a period normally considerably colder—the mean temp. averaged 48°·3; and during the whole 21 days there were only 3 with a mean below 45°; the only element in which the 9 days of 1897 exceeds the 21 days of 1869 being the average min., 44°·6 for the former and 43°·3 for the latter.

This period of 1869 is so remarkable that we give the whole of the readings in Table II. :—

TABLE II.—*Shade Temperature at Camden Square, London, January 28th to February 17th,* 1869.

DATE.	9 A.M.	9 P.M.	MAX.	MIN.	MEAN 9 A.M. 9 P.M. M. and m.
	°	°	°	°	°
Jan. 28...	47·2	49·5	53·8	37·6	47·0
,, 29...	46·8	45·5	51·9	46·2	47·6
,, 30...	44·0	49·5	52·7	40·4	46·7
,, 31...	52·6	53·1	56·3	43·0	51·2
Feb. 1...	52·8	49·0	55·1	51·2	52·0
,, 2...	44·0	40·8	49·2	42·4	44·1
,, 3...	48·4	51·2	55·0	33·9	47·1
,, 4...	53·0	49·8	57·2	43·5	50·9
,, 5...	50·2	48·2	60·8	45·8	51·3
,, 6...	48·2	46·2	57·8	42·8	48·8
,, 7...	52·3	50·0	53·7	42·5	49·6
,, 8...	53·2	53·0	54·0	48·8	52·2
,, 9...	49·8	46·5	50·8	47·6	48·7
,, 10...	50·5	51·8	55·7	44·6	50·6
,, 11...	54·0	48·7	56·4	49·8	52·2
,, 12...	42·0	37·8	50·8	41·9	43·1
,, 13...	40·1	42·8	48·8	32·0	40·9
,, 14...	46·5	48·8	50·5	38·6	46·1
,, 15...	47·2	46·3	49·2	45·6	47·1
,, 16...	47·6	50·9	52·4	43·9	48·7
,, 17...	50·8	46·2	53·6	46·8	49·4
Average ...	48·6	47·9	53·6	43·3	48·3

Selecting the warmest 9 consecutive days in Feb. 1869 and comparing them with the 1897 means at the foot of Table I., we have—

		9 a.m.	9 p.m.	Max.	Min.	Mean Temp.
		°	°	°	°	°
1869.	Feb. 3–11.	51·1	49·5	55·7	44·4	50·2
1897.	Feb. 19–27.	47·4	47·5	53·2	44·6	48·2
Excess in 1869.	... ...	3·7	2·0	2·5	—	2·0
Excess in 1897.	... ...	—	—	—	0·2	—

showing higher values in 1869, except in the one element of min. temp. where the difference is trifling.

In the whole of the 40 Februaries over which the observations extend, we have been able to find only 5 instances of 9 warmest days in which any one component (*i.e.*, 9 a.m., 9 p.m., max. or min.)

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of the mean temp. exceeded the corresponding value for 1897. These are set out in Table III., which is self-explanatory. It shows that although no year but 1869 can show a warmer nine-day period in February than 1897, one or two run it very close, notably 1877.

TABLE III.—*Warm Nine-day Periods in February.*

YEAR.	PERIOD.	9 A.M.	9 P.M.	MAX.	MIN.	MEAN.	No. of Components higher than in 1897.
		°	°	°	°	°	
1867	12th – 20th	47·4	47·6	52·7	42·9	47·6	1
1868	21st – 29th	47·8	45·6	53·9	41·9	47·3	2
1869	3rd – 11th	51·1	49·5	55·7	44·4	50·2	4
1876	15th – 23rd	48·2	47·0	52·8	43·0	47·8	1
1877	7th – 15th	48·8	47·4	53·8	42·3	48·1	2
1897	19th – 27th	47·4	47·5	53·2	44·6	48·2	...
No. of instances higher than 1897.	...	4	2	3	0	1	10

THE GALE OF MARCH 3RD, 1897.

THE damage caused by the above gale all along the south coast of England has been so fully described in the newspapers, that we do not think it necessary to dwell upon it—but the two following notes from old correspondents give details not to be found elsewhere.

To the Editor of the Meteorological Magazine.

SIR,—The gale on Ash Wednesday morning was sufficiently severe to attract your attention and investigation, so here are some notes from North Cadbury.

MARCH 2nd.—Wind rose suddenly at 3 p.m., and barometer, which had fallen slowly all morning, fell rapidly after 4 p.m.; by 10 p.m. it was down to 28·90 (aneroid).

MARCH 3rd.—4 a.m., at 28·83; 7 a.m., 28.84; rapid rise began about 8 a.m., and then the wind, which had been *strong* for the previous 17 hours, became *serious*; just before 9 it became *alarming*. S.W. overnight, it had slowly veered to due W. and there it stuck. It had rained off and on from the said 3 p.m., pretty continuously though, and now began to snow; at 9 a.m. I went out to measure the rain (·70 in.) under great difficulties from the fury of the wind. A large elm had fallen across a road into my paddock just before. I saw a thorn go while at the rain-guage; another elm went immediately

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after. Mrs. Boys saw the two elms go. I won't enumerate all the disasters, trees, chimneys, thatch, tiles, &c. But though there is no getting accurate time from anyone else, I am pretty sure that most of the damage was done, as in the Midland hurricane, in a very short time—between 9 and 9.15 a.m. It was *not* so bad as the Midland hurricane at Easton Mauduit, Northamptonshire, in 1895, but not far short of it. The general testimony of my farmers is "worst wind they ever knew."

You may be interested to learn that 17 panes of glass (nearly a square yard) in the westernmost window of the S. side of the Church were *blown outwards*. Not a scrap of glass was inside. They were *not* exposed to the wind.

I cannot tell when this glass went. Can only infer that at the time of the great blasts (9—9.15) there was diminished pressure outside the building, and so the weakest glass went.—Yours very truly.

H. A. BOYS.

North Cadbury Rectory, Bath.

To the Editor of the Meteorological Magazine.

SIR,—A terrific W.N.W. gale blew from 6.30 to 7 a.m. this morning, causing much damage to roofs and trees. The barometer (corrected to 32° and sea level) fell from 29·852 in. at 8.15 a.m. yesterday (2nd) to 28·860 in. at 2.50 a.m. this morning (as much as 0·158 in. from 5 to 6 p.m., when it was 29·289 in.), and rose to 29·620 in. at 9.17 p.m. this evening. The temperature rose from 34°·0 in the early morning of the 2nd to 49°·2 last evening, fell to 37°·2 between 9.17 and 11.40 a.m. to-day, and rose to 44°·1 since. The dry and wet bulb thermometers read 40°·6 and 39°·1, with a light W. wind and cloudy sky at 9.17 a.m.; 48°·9 and 48°·0, with a S.S.W. gale and slight rain at 9.17 p.m. yesterday; 41°·0 and 35°·3, with a W.N.W. gale and clouds at 9.17 a.m., and 39°·8 and 37°·1, with a W.N.W. breeze and clear sky at 9.17 p.m. to day. A solar halo was seen from 10 to 11 a.m. yesterday; showers fell to 1.47 p.m., rain from 2.45 to 9.25 p.m. (heavy at times from 4 to 6 p.m.), and showers after 11.5 p.m. yesterday, with H. and S. to-day and L. about 1 a.m.; 1·00 in. fell in 12 hours ending 9.17 p.m. yesterday, 0·07 in. more up to 9·17 a.m. to-day, and 0·04 in. to 9 p.m. A heavy S. gale blew from 7 to 7.30 p.m. yesterday, which veered to S.W. and lulled at 10 p.m., but rose again in the early morning and veered to W.N.W. at 6.30 a.m., and blew very hard till 8 a.m. to-day.—Yours truly,

EDWIN E. GLYDE.

Rose Villa, Tavistock, March 3rd, 1897.

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THE HEREFORD EARTHQUAKES.

WE have just found in a privately printed paper by H. Lawson, F.R.S., the following remarkable confirmation of our suggestion as to the frequency of Hereford earthquakes—

1841.—"An unusual phenomenon in this part of England occurred in Hereford on the morning of the 25th of January, when about 3 o'clock the shock of an earthquake was sensibly felt in Castle Street, Harley Court, the High-town and Bewell Street, and produced the emotion of fear in all those who felt it, *viz.*, eight persons. It was spoken of by them as causing an indescribable sensation, accompanied by the apparent tilting of the bed on which they were lying. The wind was still and about N.W.; and freshened about half an hour afterwards, when a considerable fall of snow followed. At the same hour in the neighbourhood of Carmarthen a very smart shock of an earthquake took place."—H. LAWSON, F.R.S.

ROYAL METEOROLOGICAL SOCIETY.

AT the meeting of this Society on Wednesday evening, Feb. 17th, Mr. Edward Mawley, F.R.H.S., President, read a report on the "Phenological Observations during the Past Year." He showed that throughout the flowering season wild plants came into bloom much in advance of their usual time, and were, as a rule, earlier than in any year since 1893. The wealth of blossom on nearly all kinds of trees and shrubs was a noteworthy feature of the spring and early summer, while the abundance of wild fruits in the autumn was even more exceptional. From an agricultural and horticultural point of view the one great drawback of the year, which must otherwise have proved one of the most bountiful on record, was a drought that lasted almost without break—at all events, as far as vegetation is concerned—from March to September. The wheat crop proved the largest and best for many years, while there was a good yield of barley and potatoes. The small fruits were also good. With these exceptions, all the farm and garden crops were more or less indifferent, the crop of hay being particularly scanty.

The Hon. Rollo Russell gave the results of some observations on "Haze and Transparency," which he had made at Haslemere, in Surrey. From these it appears that the clearest hours at a good distance from towns are from about noon to 3 p.m. The clearest winds at Haslemere are those from S. to N.W. inclusive, and especially W.S.W., W., and W.N.W; the haziest are those between N. and E. On bright mornings, with a gentle breeze or calm, from autumn to spring, the haze of fog which has lain on the low ground, frequently covers the hills in the course of its ascent a few hours after sunrise. At any distance within 100 miles of London, or of the Black Country, observations requiring clear views are likely to be interfered with, when the wind blows from their direction, and should therefore be taken early.

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SEISMOLOGICAL SURVEY OF THE WORLD.

WE have been reqnested to insert the following circular, so that this important undertaking may be generally known. The invitations for assistance have, we understand, been in many cases forwarded by the Foreign Office, and by the Colonial Office. Obviously, it is desirable that all parts of the earth should be represented, and it is not necessary or expedient that the observatories should be near one to another.—ED.

British Association for the Advancement of Science.

SEISMOLOGICAL COMMITTEE.

Lord KELVIN, F.R.S.
Professor W. G. ADAMS, F.R.S.
Dr. J. T. BOTTOMLEY, F.R.S.
Sir F. J. BRAMWELL, Bt., F.R.S.
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Dr. ISAAC ROBERTS, F.R.S.
Mr. G. J. SYMONS, F.R.S., *Chairman.*

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE,
BURLINGTON HOUSE,
LONDON, W.

SIR,—It has been established that the movements resulting from a large earthquake originating in any one portion of our globe can, with the aid of suitable instruments, be recorded at any other portion of the same; therefore, the Seismological Investigation Committee of the British Association are desirous of your co-operation in an endeavour to extend and systematize the observation of such disturbances.

Similar instruments should be used at all stations; and the one recommended by this Committee as being simple to work, and one that furnishes results sufficiently accurate for the main objects in view is indicated in the accompanying report (see pp. 2—4) by the letter M, a sketch of the same is shown on p. 7, whilst there is an example of one of its records on p. 49.

We desire to know whether you are disposed to purchase, and make observations with, one of these instruments, the cost of which, including photographic material to last one year, packed for shipment, is about £50. Should you reply in the affimative, we shall be pleased to arrange with a competent maker for the construction of an instrument for you, and to furnish instructions respecting installation and working. In case an instrument be established at your observatory, we should ask that notes of disturbances having an earthquake character be sent to us for analysis and comparison with the records from other stations. From time to time the results of these examinations would be forwarded to your observatory.

The first object we have in view is to determine the velocity with which motion is propagated around or possibly *through* our earth. To attain this, all that we require from a given station are the times at which various phases of motion are recorded; for which purpose, for the present at least, we consider that an instrument recording a single component of horizontal motion to be sufficient. Other results which may be obtained from the proposed observations are numerous.

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The foci of submarine disturbances, such for example as those which from time to time have interfered with telegraph cables, may possibly be determined, and a new light thrown upon changes taking place in ocean beds.

The records throw light upon certain classes of disturbances now and then noted in magnetometers, and other instruments susceptible to slight movements, whilst local changes of level, some of which may have a diurnal character, may, under certain conditions, become apparent.

Trusting that you will find it possible to co-operate in this endeavour to extend our knowledge of the earth on which we live,

We remain, Sir,

(On behalf of the Commmittee),

Your obedient servants,

G. J. SYMONS, *Chairman.*

C. DAVISON, } *Joint Honorary*
J. MILNE, } *Secretaries.*

It is requested that Replies be addressed to—

THE SEISMOLOGICAL COMMITTEE, BRITISH ASSOCIATION,
BURLINGTON HOUSE, LONDON, W.

PHENOMENAL WEATHER IN VICTORIA.

DR. ARGYLE, writing from Melbourne, on the 17th of January, to his uncle in Tamworth, says, "Our climate, at which we growl quite as much as you do in England, has gone quite mad, I think. The temperature on Thursday week was 101 deg. in the shade and terribly oppressive. On Saturday and Sunday there was a terrific storm, the thermometer dropped nearly 60 deg., and we had 4½ inches of rain in 48 hours. (This in January, usually our driest and hottest month.) To-day it has been hailing and is bitterly cold, but the sun has now come out, and I should not be surprised if it turned out hot again to-morrow. We also had an interesting phenomenon about a fortnight ago; there was a heavy fall of rain, which was full of a red dust, and the next morning the whole landscape was red. The "rain of blood," it was called, and really it looked like it. The funny thing was that it occurred on a public holiday and on a hot day, so that all the holiday-makers who were caught in it had their clothes stained a deep red, and as many people were dressed in white, you may guess what they looked like."—*Tamworth Herald*, 27th Feb., 1897.

ELECTRIC TREES IN DAKOTA.

ON January 4th, during the worst of the great wind and snowstorm at Huron, the air was heavily laden with electricity. The cottonwood trees in front of the Chicago and North-western offices presented a very strange and novel appearance. The trees were buried in snow almost to their tops, but at the end of each twig on every branch in sight was an electrical spark about as large as a common field Pea. On taking hold of a twig the spark extinguished, but on withdrawing the hand the spark reappeared. Dispatcher Wilson, who wore a glove with a hole in the thumb, took hold of a twig, and the spark transferred itself to his thumb and back to the twig when he let go. There was no shock experienced, says an American contemporary, in handling the twigs, and the light did not waver or tremble, but was quite steady. The trees looked as if a colony of fireflies had settled upon them for the purpose of an illumination.—*Journal of Horticulture*, March 4th.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, SEPTEMBER, 1896.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	71·9	8	39·6	21	64·9	51·5	51·6	82	114·1	35·3	5·51	22	6·8
Malta	91·1	5*a*	60·6	29	82·7	68·6	66·0	74	143·7	53·5	·00	0	3·3
Mauritius	79·0	28	60·2	15*b*	76·3	64·7	60·1	73	126·7	48·8	1·15	8	4·7
Calcutta	93·0	10	72·7	30	88·3	77·8	76·8	83	157·9	71·8	9·05	10	8·3
Bombay	90·9	29	75·0	18	86·6	77·6	74·7	78	143·7	69·8	1·62	9	4·7
Ceylon, Colombo	89·2	26	72·8	10	86·9	77·1	73·6	81	149·0	69·8	10·99	23	6·6
Melbourne	75·8	11	36·8	30	61·4	44·0	43·4	71	132·2	28·1	1·93	12	5·6
Adelaide	80·4	15	40·7	17*c*	67·1	46·2	45·0	68	135·0	28·7	·45	12	4·3
Sydney	78·0	13	44·6	26	64·9	51·0	44·2	70	130·9	35·3	·52	14	3·6
Wellington	63·5	7	37·0	30	57·9	46·4	44·6	76	125·0	29·0	4·57	18	4·9
Auckland	68·0	11	44·5	23	61·4	50·8	47·7	74	124·0	40·0	4·51	19	5·8
Jamaica, Kingston	92·9	8	72·1	22	89·1	74·8	72·9	76	...	...	2·92	12	...
Trinidad	92·0	14	68·0	8*d*	88·6	72·1	73·9	83	168·0	66·0	6·46	15	...
Grenada	86·4	15	71·0	8	83·7	74·9	71·6	73	154·4	...	8·49	26	4·6
Toronto	86·3	11	27·6	23	66·5	48·0	51·5	79	96·0	21·8	5·09	15	5·5
New Brunswick, Fredericton	85·7	11	27·0	24	64·2	42·3	49·0	77	...	...	7·02	11	5·2
Manitoba, Winnipeg	78·6	23	20·0	21	62·0	38·4	...	...	...	...	1·96	10	6·5
British Columbia, Esquimalt	69·9	4	37·7	26	61·1	44·5	48·4	86	...	...	1·52	5	8·8

a—and 21. *b*—and 22. *c*—and 20, 25. *d*—and 19.

REMARKS.

MALTA.—Adopted mean temp. 74°·7, or 0°·4 below the average. Mean hourly velocity of wind 8·6 miles. Average temp. of sea 77°·0. Thunderstorm on 14th. Lightning on 17th and 18th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·1 above, of dew point 0°·2 above, and rainfall ·27 in. below, their respective averages. Mean hourly velocity of wind 11·3 miles, or 0·6 below average; extremes, 26°·2 on 6th, and 2·0 on 21st; prevailing direction, E. by S. T. F. CLAXTON.

CEYLON, COLOMBO.—Lightning was seen on the 6th, 9th 19th, 28th and 29th. Thunderstorms occurred on the 20th, 21st and 30th. A. E. WACKRILL.

Adelaide.—Mean temp. 0°·5 below the average for 39 years. A very dry month, the total rainfall being ·45 in., whilst the average is 1·79 in. A very severe drought over the whole of the colony especially during the past three months. C. TODD, F.R.S.

Sydney.—Rainfall 2·63 in. below, temperature 0°·7 below and humidity 0°·5 below, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery up to the 5th, then fine to the 16th and showery for the remainder of the month, with generally strong N.W. and S.E. winds and cold weather. Slight snow on 27th and snow on the hills on 30th. Hail on 27th, 29th and 30th. Mean temp. 1°·2 above, and rainfall ·31 in. above, their respective averages. R. B. GORE.

Auckland.—Beginning and close of the month stormy, wet and disagreable; middle very fine, warm and dry. Mean temperature and rainfall much in excess of the average. T. F. CHEESEMAN.

TRINIDAD.—Rainfall 1·07 in. below the average of 30 years. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, FEBRUARY, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	3·04	XI.	Rhayader, Nantgwillt ...	4·19
II.	Dorking, Abinger Hall .	3·37	,,	Lake Vyrnwy	6·14
,,	Birchington, Thor	1·96	,,	Corwen, Rhug	3·09
,,	Hailsham	3·18	,,	Criccith, Talarvor..... ...	3·48
,,	Ryde, Thornbrough	3·51	,,	I. of Man, Douglas	3·62
,,	Emsworth, Redlands ...	3·38	XII.	Stoneykirk, Ardwell Ho.	2·37
,,	Alton, Ashdell	3·65	,,	New Galloway, Glenlee	4·44
III.	Oxford, Magdalen Col..	2·21	,,	Lilliesleaf, Riddell	1·73
,,	Banbury, Bloxham	2·77	XIII.	N. Esk Res. [Penicuick]	2·30
,,	Northampton, Sedgebrook	2·94	,,	Edinburgh, Blacket Pl..	1·42
,,	Duddington [Stamford].	2·95	XIV.	Glasgow, Queen's Park..	2·85
,,	Alconbury	2·37	XV.	Inverary, Newtown	7·12
,,	Wisbech, Bank House...	2·26	,,	Oban, The Corran	4·07
IV.	Southend	2·05	,,	Islay, Gruinart School ...	·91
,,	Harlow, Sheering..... ...	1·04	XVI.	Dollar.....	2·60
,,	Colchester, Lexden	2·33	,,	Balquhidder, Stronvar...	8·13
,,	Rendlesham Hall	2·23	,,	Ballinluig	1·99
,,	Rushall Vicarage	2·17	,,	Dalnaspidal H.R.S.....	5·49
,,	Swaffham	2·34	XVII.	Keith H.R.S.....	·56
V.	Salisbury, Alderbury ...	3·42	,,	Forres H.R.S.	·62
,,	Bishop's Cannings	3·10	XVIII.	Fearn, Lower Pitkerrie..	·66
,,	Blandford, Whatcombe .	4·11	,,	N. Uist, Loch Maddy ...	4·28
,,	Ashburton, Holne Vic...	3·76	,,	Invergarry	6·50
,,	Okehampton, Oaklands.	4·82	,,	Aviemore H.R.S.	1·56
,,	Hartland Abbey	5·45	,,	Loch Ness, Drumnadrochit	2·42
,,	Lynmouth, Glenthorne.	4·01	XIX.	Inversbin	1·00
,,	Probus, Lamellyn	4·81	,,	Scourie	3·40
,,	Wellington, The Avenue	4·25	,,	Watten H.R.S.....	·88
,,	Wincanton.....	4·32	XX.	Dunmanway, Coolkelure	6 75
VI.	Clifton, Pembroke Road	3·59	,,	Cork, Wellesley Terrace	2·74
,,	Ross, The Graig	2·19	,,	Killarney, Woodlawn ...	4·15
,,	Wem, Clive Vicarage ...	2·07	,,	Caher, Duneske	...
,,	Cheadle, The Heath Ho.	3·14	,,	Ballingarry, Hazelfort...	1·78
,,	Worcester, Diglis Lock	2·34	,,	Limerick, Kilcornan ...	1·22
,,	Coventry, Kingswood ...	3·59	,,	Broadford, Hurdlestown	1·62
VII.	Grantham, Stainby	3·92	,,	Miltown Malbay	3·35
,,	Horncastle, Bucknall ...	2·67	XXI.	Gorey, Courtown House	1·98
,,	Worksop, Hodsck Priory	3·03	,,	Athlone, Twyford	2·42
,,	Neston, Hinderton	2·07	,,	Mullingar, Belvedere ...	3·35
VIII.	Southport, Hesketh Park	2·51	,,	Longford, Currygrane...	2·54
,,	Broughton-in-Furness ...	3·51	XXII.	Woodlawn	2·86
IX.	Ripon, Mickley.....	2·70	,,	Crossmolina, Enniscoe ..	4·65
,,	Melmerby, Baldersby ...	1·90	,,	Collooney, Markree Obs.	3·30
,,	Scarborough, Observat'y	1·92	,,	Ballinamore, Lawderdale	3·20
,,	Middleton, Mickleton ...	2·17	XXIII.	Lough Sheelin, Arley...	...
X.	Haltwhistle, Unthank...	2·85	,,	Warrenpoint.....	2·16
,,	Bamburgh	·88	,,	Seaforde.....	2·53
,,	Keswick, The Bank.....	4·49	,,	Belfast, Springfield	2·47
XI.	Llanfrechfa Grange	3·72	,,	Bushmills, Dundarave..	2·37
,,	Llandovery	4·78	,,	Stewartstown	2·86
,,	Castle Malgwyn	2·77	,,	Killybegs	5·32
,,	Builth, Abergwesyn Vic.	6·60	,,	Lough Swilly, Carrablagh	3·31

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FEBRUARY, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	No. of Nights below 32°. On grass
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·75	+ ·87	·59	4	14	58·0	26	27·9	8	2	9
II.		Maidstone (Hunton Court)...	2·32	+ ·52	·85	1	10	...	...	...	...	...	...
,,		Strathfieldsaye	3·84	...	·78	4	15	...	...	...	...	...	...
III.		Hitchin	2·34	+ ·59	·46	5	16	56·0	26	28·0	7	7	...
,,		Winslow (Addington)	2·60	+ ·44	·46	5	13	57·0	22	29·0	8, 18	5	10
IV.		Bury St. Edmunds (Westley)	2·33	+ ·77	·58	5	14	56·0	26	28·0	3	...	...
,,		Norwich (Brundall)	2·17	...	·58	5	18	57·8	26	27·4	3	6	12
V.		Weymouth(LangtonHerring)	4·43	+ 1·83	1·29	4	17	53 0	14*b*	32·0	1	1	...
,,		Torquay (Cary Green)	2·98	...	·79	4	15	56·4	20*c*	35·0	1, 17	0	2
,,		Polapit Tamar [Launceston]..	3·94	+ ·67	·75	1	18	53·4	23	30·0	15	3	3
VI.		Stroud (Upfield)	2·94	+ ·38	·54	19	17	56·0	22	33·0	1 & 2	0	...
,,		ChurchStretton(Woolstaston)	2·39	— ·06	·35	1	17	58·0	23	31·0	2*e*	8	15
,,		Tenbury (Orleton)	2·21	— ·27	·39	1	12	61·5	22	26·8	28	3	11
VII.		Leicester (Barkby)	2·78	+ ·97	·96	5	18	57·0	26	24·0	27	11	18
,,		Boston	2·90	+ 1·22	·76	4	15	52·0	26	27·0	12	9	...
,,		Hesley Hall [Tickhill].....	2·68	+ 1·18	·86	5	17	57·0	26	25·0	12	11	...
VIII.		Manchester(PlymouthGrove)	2·39	+ ·34	·42	1	19	54·0	28	27·0	6	5	7
IX.		Wetherby (Ribston Hall) ...	1·24	— ·34	·60	6	4	...	...	...	...	...	...
,,		Skipton (Arncliffe)	5·81	+ 1·12	1·28	25	17	..	...	...	...	...	...
,,		Hull (Pearson Park).	2·53	+ ·73	·72	5	15	59·0	26	25·0	1	11	13
X.		Newcastle (Town Moor)	1·13	— ·27	·30	5	11	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	12·42	— ·22	2·68	8	19	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	4·79	+ 1·60	·65	4	22	...	...	...	...	...	...
,,		Haverfordwest	3·52	— ·60	·62	18	23	52·9	26	29·7	28	2	8
,,		Aberystwith (Gogerddan) ...	4·96	+ 1·70	·58	19	21	51·0	10	...	...	...	...
,,		Llandudno.....	2·37	+ ·45	·30	1	20	55·0	26	34·5	1	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·63	— ·02	·78	24	14	57·6	22	25·0	12	8	...
,,		Jedburgh (Sunnyside).....	...	...	...	...	...	...	...	...	...	...	...
XIV.		Colmonell	2·63	...	·51	28	18	56 0	19	26·0	11	...	...
XV.		Lochgilphead (Kilmory).....	4·02	— 1·17	·77	24	18	...	...	24·0	9	5	...
,,		Mull (Quinish).....	3·30	— 2·17	·66	4	19	...	...	...	...	...	...
XVI.		Loch Leven Sluices	2·40	— ·35	1·00	26	11	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	·85	— 1·25	·35	25	14	59·5	22	25·6	3	9	...
XVII.		Braemar	1·52	— 1·84	·42	25	11	54·0	22	—7·0	4	12	16
,,		Aberdeen (Cranford)	·60	...	·20	28	13	...	...	7·0	3	16	...
,,		Cawdor (Budgate)	·98	— 1·25	·21	25	11	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	3·95	— ·76	1·07	26	10	...	...	...	...	...	...
,,		Glencarron Lodge.....	6·32	...	1·37	25	21	52·5	19	17·9	4	12	...
XIX.		Dunrobin	1·22	— ·87	·32	20	11	56·0	23	20·0	4	10	...
,,		S. Ronaldsay (Roeberry).....	1·50	— 1·14	·19	25	20	50·0	22*d*	21·0	3	12	...
XX.		Darrynane Abbey.....	4·12	...	·39	12	22	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	2·13	— 1·95	·37	3	18	57·0	22	31·0	28	1	...
,,		O'Briensbridge (Ross)	2·73	...	·49	24	22	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	1·80	— 1·28	·21	8*a*	16	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·40	— ·95	·27	2	16	59·7	19	35·0	1	0	4
XXII.	IRELAND.	Ballinasloe	2·44	— ·34	·46	1	22	54·0	25	31·0	25	2	...
,,		Clifden (Kylemore)	5 63	...	·94	24	22	...	...	...	...	...	...
XXIII		Waringstown	2·43	— ·02	·34	4	18	57·0	25	28·0	11	5	12
,,		Londonderry (Creggan Res.).	2·97	— ·06	·50	24	22	...	...	...	...	...	...
,,		Omagh (Edenfel)	3·42	+ ·73	·64	8	19	54·0	25	30·0	11	3	8

+Shows that the fall was above the average ; —that it was below it.

a—and 24. *b*—and 26. *c*—and 22. *d*—and 23, 25 and 26. *e*—3 and 18.

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METEOROLOGICAL NOTES ON FEBRUARY, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

ADDINGTON.—The heavy rainfall on the first five days of the month, helped by the rainfall of the last four days of January, caused very large and continuous floods, the meadows being covered with water to a very wide extent for a longer time than usual. A very thick fog on the 23rd; high wind on the 24th, 25th and 26th. Weather generally dull.

BURY ST. EDMUNDS, WESTLEY.—A mild month, the latter part very fine and favourable for agriculture. Vegetation forward.

NORWICH, BRUNDALL.—The earlier part of the month was rainy and sunless; the latter part bright, and some days were unusually warm for the season. A heavy fall of S occurred at night on 1st, the ground being covered for four days. Fog on 3rd. Floods on marshes on 7th. Gale from 4 a.m. to 6 a.m. on 21st; some gusts very violent.

WEYMOUTH, LANGTON HERRING.—The month was very mild throughout; from the 1st to the 13th no less than 3·69 in. of R fell. With the exception of 1881 and 1883, when 4·76 in. and 4·73 in. fell respectively, the wettest February in 23 years. The average temp. at 9 a.m., 43°·7, is 4°·5 above the average, and the highest since 1877, when it was 44°·0. February, 1897, and February, 1895, compared, show a striking difference:—

	Average, 9 a.m.	Min.	Max.
1897	43°·8	40°·5	48°·2
1895	27°·0	23°·7	33°·8

Fogs occurred on 10 days (some of them dense) in the first half of the month. February was without frost, the 32° registered on the 1st being the temp. of the evening of January 31st.

TORQUAY, CARY GREEN.—Rainfall ·46 in. above the average; mean temp. 46°·6, or 3°·6, above the average. Duration of sunshine 52 hours, being 26 hours 45 minutes below the average; 11 sunless days.

POLAPIT TAMAR [LAUNCESTON].—A very wet and unseasonably warm month. Exactly seven inches of rain has fallen during the two months of the year, compared with 1·89 in. for the corresponding period of 1896.

STROUD, UPFIELD.—S.W. gale on 26th. Wind S.W. on 15 days, S.E. on 4 days, and N.W. on 7 days.

WOOLSTASTON.—A seasonable month, with no extremes of temp. S fell on the 2nd. Mean temp. 42°·3.

TENBURY, ORLETON.—The first five days were very wet and damp, with a large amount of fog; but afterwards the weather was fine, with a large percentage of sun. From the 13th to the end of the month the temp. reached 50° on every day, and the mean temp. of the month is more than 3°·5 above the average. S about two inches deep on 2nd.

LEICESTER, BARKBY.—Warmth above average. Very high winds during the last week. Mean temp. 41°·2.

WALES.

HAVERFORDWEST.—One of the most gloomy, foggy and wet Februaries ever registered here, although the rainfall was never at any time large. There was very little frost and there were no gales of any magnitude. Lunar halos were

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seen on the 14th and 16th. Fog occurred on 18 days and the wind blew mostly from southerly points. The readings of the bar. were remarkably high on the 15th, 16th, and 17th, and again on the 21st, 22nd, and 23rd. Highest 30·673 in. (cor. and red.) at 9 p.m. on the 22nd.

ABERYSTWITH, GOGERDDAN.—Very stormy throughout the month and very mild and sunless.

SCOTLAND.

CARGEN [DUMFRIES].—The month was characterized by constant atmospheric fluctuations. Bar. pressure is slightly above the average of 38 years while the temperature is 2° above the mean for that period. Exactly the contrary experience of last year, the first half of the month was very much colder than the last; the mean temp. of the first thirteen days being 36°·5 and from 14th to 28th 45°·5; the point reached by the maximum on the 22nd, 57°·6, has been exceeded only twice, 58°·4 being registered on 20th February, 1891, and 57°·9 on 23rd February, 1862. One inch of S fell on the 3rd. During the early hours of 21st a somewhat violent S.W. gale was experienced and a fresh breeze from the same quarter blew on the 25th. Though compared with last year vegetation is backward, a fair start has been made in spring growth, and pastures have a promising appearance, farm work, however, has been much retarded by the wet weather during the latter half of the month.

COLMONELL.—Rainfall 1·11 in. below, mean temp. 3°·8 above, the average of 20 years.

BRAEMAR.—With the exception of the extreme frost on 3rd and 4th, *viz.*, 2° and 7° below zero, an unusually fine month.

ABERDEEN, CRANFORD.—The last two weeks of the month were warm, the max. temp. ranging from 42° to 59°.

S. RONALDSAY, ROEBERRY.—The first half of the month was cold and windy, the last half mild and damp. Mean temp. 38°·2.

IRELAND.

DARRYNANE ABBEY.—A very mild month with much mist and fog.

O'BRIENSBRIDGE, ROSS.—The temperature of the month was much above the average.

DUBLIN.—Taken as a whole, this was one of the mildest Februaries on record in Dublin, there was scarcely any frost even on the ground, and the sky was often densely clouded. The first third of the month was gloomy and wet. Equatorial winds were prevalent during the greater part of the month. The mean temp. 46°·0 was 3°·7 above the average. Neither Hail, Sleet nor S fell. Foggy on 7 days. Cloud much above average. High winds were noted on 7 days and reached the force of a gale on the 18th, 20th, 24th, 25th and 26th. A lunar halo was seen on the 16th.

OMAGH, EDENFEL.—A seasonable February with as a rule dull, dark weather. Rainfall and temperature were both rather over the average and atmospheric pressure was very unsteady.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXV.] APRIL, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

THE FIRST DAILY WEATHER MAP.

IN our number for September, 1896, we gave a photographic reproduction of the first daily weather map ever published, and promised to give its history as soon as we had concluded our enquiries.

Perhaps it is rash even now to assume that these enquiries are complete, for completeness is rarely attainable, and the publication of this note may lead to some fresh facts being brought to our notice—if so, so much the better, and we will insert them in a subsequent number.

As far as we can trace the facts they are as follow :—

In 1849 the proprietors of the *Daily News* decided upon collecting and publishing daily reports of the direction and strength of the wind and of the state of the weather. The organization was entrusted to Mr. Glaisher, F.R.S., who received from the various companies a pass over nearly every railway in the country, which enabled him to fix the compass points and instruct the clerks at each station, and, either then or subsequently, to erect barometers at many of them, all, we believe, with the hearty co-operation of the Electric Telegraph Company, the cost being borne partly by Mr. Glaisher, partly by the *Daily News*. The issue of that journal for June 14th, 1849, contained the first fruits of this enterprise, in the shape of the earliest telegraphic Weather Report known to us.

During the subsequent two years the system was greatly developed ; the Electric Telegraph Company was incorporated in 1846, and by 1851 had erected about 2,000 miles of wire, and during the great Exhibition of 1851, Mr. (now Sir George) Grove, as Secretary of the Society of Arts, decided upon issuing the information, collected by the Electric Telegraph Company, in the form of the Daily Weather Map, the lithographic production of which was entrusted to Mr. Trelawny Saunders, F.R.G.S., the first of which, for August 8th, 1851, was the one reproduced by us last September from a set kindly presented to us by H.M. Royal Commissioners of the 1851 Exhibition.

It is noteworthy that now, 46 years afterwards, all the persons chiefly concerned have assisted us in thus placing on apparently indisputable record, the history of the First Daily Weather Map.

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INDEX TO VOLS. I.–XXX. OF THE *MET. MAG.*

THANKS greatly to the help of an old observer, who will not let me mention his name, the very heavy labour of preparing the Index is ended, and proofs are to be ready on April 24th.

Probably no one who ever compiled an index was satisfied with it when it was done, and I am not contented with mine. I think that many additional entries of subjects should be made from the Reviews —and of course in many thousand entries there must be mistakes.

I have always received so much help from my correspondents, that it has occurred to me that perhaps a few would not mind reading some portions of the proof, and suggesting additions and corrections. It will be easy to have a few extra proofs, and I will gladly send a copy to anyone who volunteers promptly. G. J. SYMONS.

SCIENTIFIC KITE WORK IN THE ARCTIC REGIONS.

In the *Met. Mag.* for August, 1896, Mr. Laurence Rotch directed attention to the use of Kites in Scotland, in 1749, by Dr. Wilson.

In the *Met. Mag.* for February, 1895, we mentioned that Admiral Back is reported to have used a Kite to ascertain the temperature of the upper air in the Arctic Regions in 1836–7.

We now add the record of another earlier experiment made during the winter 1822-23. It forms a foot note to the excellent article on "Meteorology" contributed to the Encyclopedia Metropolitana, by Dr. G. Harvey, F.R.S.

"We are only acquainted with a single experimental observation, made with a view of discovering the decrement of temperature in high latitudes. This experiment was performed by the Rev. George Fisher, and the intrepid navigator, Captain Sir Edward Parry, at the Island of Igloolik, in lat. 69° 21′ N., and long. 81° 42′ W,

"A paper kite was hoisted, to which was attached an excellent register thermometer, in a horizontal position. Its height above the level of the frozen sea, upon which the experiment was made, was determined by two observers in the same vertical plane, taking its altitude at the same time above the distant horizon; and thence its height was computed. The greatest height observed was 379 ft., at which it was nearly stationary for a quarter of an hour, although it had probably been more than 400 ft. above the sea. The experiment was made under very favourable circumstances, the kite being sent up and caught in coming down, without the slightest agitation. 'The indices,' says Mr. Fisher, 'had not altered their position in the slightest degree, and they would have indicated any variation of temperature, had it existed, to less than a quarter of a degree, Fahrenheit.' The temperature at the time was —24° Fahrenheit.

"Dr. Young, in alluding to this interesting experiment, remarks that the law of decrease of temperature must be supposed to be very different in the Arctic regions from that which prevails in more moderate latitudes. The inference, however, is by far too sweeping, resting as it does on a single experiment. We may hope, however, that time will make known more perfectly many of the Physical conditions of the Polar regions."—*Meteorology*, by G. Harvey, F.R.S. in the *Encyclopedia Metropolitana*, 1834, p. 73.

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THE COLDEST COUNTRY IN THE WORLD.

In the new bulletin of the Royal Geographical Society of Irkutsk, Professor Sergus Kovalik gives an interesting account of "Life in the Coldest Country in the World." It is that of Werchojansk, in Siberia (Lon. 133° 51′ E., Lat. 67° 34′ N.), where the lowest temperature of —90 deg. Fah. has been observed, and the mean of January is —48 deg. Fah. It is inhabited by about 10,500 persons of the Jakut and Lamat races. In a large part of the region, according to Prof. Kovalik, the air is so dry and the winds are so rare that the intensity of the cold cannot be fully realised. In the most distant parts of the East there are sometimes terrible storms, which are most fatal to life in their consequences. During the summer time the temperature occasionally rises to 86 deg. Fah. in the shade, while it freezes at night. The latter part of this season is often marked by copious rains and extensive inundations, which invariably lay waste a vast acreage of land, and prove to be a serious obstacle to the cultivation of the soil. Vegetation is very scanty. There are practically no trees, only wide, open meadows. The people hunt fur-bearing animals, fish, and raise cattle and reindeer. It requires about eight cows to support a family, four being milked in the summer and two in the winter. The cattle are very small in size, and are fed with hay in winter. Occasionally they are allowed to go out when there is the slightest break in the weather, but their teats are always carefully covered up with felt. Milk is the principal food. This is sometimes supplemented with hares, which are quite abundant, but not very relishable. The houses are constructed of wood, covered with clay, and as a rule consist of only one room, in which the people and animals live together. The upper and wealthier classes are better provided with lodging and food. As a race they are exceedingly courteous and very hospitable, and they are excessively punctilious concerning points of honour, such as the place at table and the proper place at festivals.—*Echo.*

We may supplement this by a few Werchojansk figures from Dr. Wild's *Temperatur-verhältnisse des Russischen Reiches*:—

Monthly Mean Temperature.

	Jan.	Feb.	Mar.	Apl.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Year.
1869	—56°4	—54°8	—29°4	6°8	31°3	56°1	59°7	53°4	36°1	7°0	—29°4	—46°8	2°8
1871	..	..	..	..	..	..	..	..	..	..	—47·6	—53·7	..
1872	—55·8	—51·2	—28·5	..	..	..	..	..	..	..	..	..	..
Mean	—56·1	—53·0	—28·9	6·8	31·3	56·1	59·7	53·4	36·1	7·0	—38·5	—50·3	2·0

Absolute Monthly Maxima.

	—18·6	— 8·5	2·8	41·4	55·8	84·2	84·0	86·2	53·4	36·5	— 1·3	— 8·0	86·2

Absolute Monthly Minima.

	—76·0	—79·4	—67·4	—25·2	—4·0	41·2	42·4	35·6	19·2	—29·9	—56·4	—81·8	—81·8

In 1883 verified thermometers and a Stevenson screen were sent to this interesting station, and the mean temperatures from 1883 to 1887 were as follows:—

1883	..	..	..	..	..	..	..	..	..	..	—37·1	—59·4	..
1884	—64·5	—52·8	—43·2	2·7	31·1	51·3	..	..	..	..	..	—49·9	..
1885	—63·0	—50·8	—19·8	—1·7	28·0	48·4	60·1	43·5	29·1	— 2·4	—47·6	—63·0	— 3·3
1886	—64·1	—47·2	—37·3	4·5	27·7	37·9	..	..	..	— 6·5	—36·0	—58·9	..
1887	—62·9	—54·4	—21·6	9·0	40·6	59·9	53·6	..	..	..	..	..	..
Mean	—63·6	—51·3	—30·5	3·6	31·8	49·3	56·8	43·5	29·1	— 4·4	—40·2	—57·8	— 2·7

Habituated to temperatures like these, the Lamats would find the winter climate of the North Pole quite mild.

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ROYAL METEOROLOGICAL SOCIETY.

DIAMOND JUBILEE MEETING AND EXHIBITION.

AT the Ordinary Meeting held on Wednesday evening, March 17th, a lecture was delivered by Mr. G. J. Symons, F.R.S., on "Meteorological Observations in 1837 and 1897." It might be thought, he said, that by merely sorting out the meteorological instruments invented prior to 1837 we should at once have a statement of what were in use at that date, but that notion was quite wrong. For example, dry and wet bulb thermometers, used synchronously as a hygrometer, were employed by Professor Boeckmann, of Carlsruhe, in 1802; they were again used (probably reinvented) by the Rev. Mr. Gordon, of Kinfauns, Perth, in 1817; and after another 19 years were brought out as a novelty by Mr. J. A. Mason in 1836; yet Mr. Symons did not know of one single station at which a dry and wet bulb hygrometer was in regular use in 1837. Therefore, the mere dates of inventions were of no help in determining the usual equipment of a meteorological station in the first year of the Queen's reign. For more than half of the period with which the paper dealt, he had not merely been collecting records of rainfall for current years, but had been searching for old records, and thus he had gradually accumulated returns for bygone years, far more numerous than those known to any one living at that time, since in 1837 postage, printing, and intercourse generally were very different from what they are now. It occurred to him that a list of the observers at work in 1837 would bring to his mind many facts that otherwise he would not think of, and the further idea arose of tabulating the rainfall for that year. This table contained perfect records from 91 stations in England, 5 in Wales, 60 in Scotland, and in 5 Ireland, together, with incomplete returns from 19 other stations, in all 180. More than half of these were merely rainfall stations, at which no records of barometer, thermometer, hygrometer, or anemometer were made. Mr. Symons proceeded to describe the instruments which he knew to have been used by good, ordinary observers in 1837, and which could have been obtained at once by any one going to the shops of the opticians of the day. He then briefly enumerated the usual forms of instruments employed at the present time, detailing the equipment of ordinary meteorological stations. Lastly, he showed what he thought might in many respects be regarded as the essence of much that had gone before, and of the marvellous progress which had characterised the Victorian reign. Thanks to the help of Mr. Scott and Mr. Gaster, he was able to exhibit in the lantern a chart showing the state of the weather over Western Europe only an hour or two before the time of the lecture. We were, he said, so used to weather maps that they did not strike us as at all a marvel, but when we looked into details they really were startling. There were records for that day from the sunny Riviera, eastwards as far as Berlin, and northwards, not only up to the top of the Gulf of Bothnia, but actually up to Bodo, within

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the Arctic circle. If that did not prove the existence of a wide-spread interest in meteorological work, excellent organization, and the wonderful development of human intercourse, he did not know how otherwise it could be demonstrated.

At the conclusion of the lecture, Mr. Birt Acres, by means of a cinematoscope, exhibited some photographic studies of clouds and waves.

OUR IMPRESSIONS OF THE EXHIBITION.

The Annual Exhibition of the Royal Meteorological Society—usually held in conjunction with the Ordinary Meeting in March—was this year, in commemoration of the sixtieth year of Her Majesty's reign, devoted to a display of the instruments in use by meteorologists in 1837 and 1897.

The instruments accredited to the earlier period comprised—

6 Barometers.
10 Thermometers.
9 Hygrometers.
3 Rain Gauges.
3 Anemometers.
1 Actinometer.

Several of these would probably be excluded if the rigid limitation adopted by Mr. Symons in his descriptive lecture had been adhered to, inasmuch as one or two were undoubtedly of more recent form and construction, while others—though invented before 1837—were not in general use at the time.

The most striking characteristic of the barometers is perhaps an absence of that precision now considered requisite. No. 6 in the catalogue being a good illustration of this.

> "6. *Large Cistern Barometer.*—This instrument was made for the Meteorological Society of London in 1837 by Mr. R. C. Woods, and cost forty guineas. The proportion of the calibre of the tube to that of the cistern is as 1 : 50, a proportion which was considered sufficient to obviate the necessity for applying capacity corrections. The tube and cistern originally held 70 lbs. of mercury."

On the other hand, Morland's diagonal, or open scale barometer, was obviously designed with a view to greater accuracy in reading. We have never heard of one of these in actual use, probably owing to modern patterns attaining the desired accuracy by other means.

The thermometers show little variation from modern forms, barring a general tendency to larger bulbs and bores and consequent sluggishness; a notable exception being the Maximum, made by Prof. Phillips himself, with a bulb of quite modern smallness, but apparently with round bore and somewhat close scale.

Modern hygrometers again show little advance over those exhibited, if we assume that those dependent on a hygroscopic substance such as

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catgut, swansquill, whalebone, vegetable fibre, &c., for their indications were little used for scientific records. Yet the hair hygrometer belonging to the same class is in very general use on the continent, and has, we think, been unjustly discredited in this country; for, in the recording form exhibited by Messrs. Richard Freres, it gives a beautiful trace, and is more reliable in frosty weather than are the dry and wet in the hands of the average observer.

Of dew-point hygrometers, Daniell's is capable of as great a degree of precision as any modern rival, though Dines's shows a great gain in convenience by replacing the ether by water.

Chemical hygrometers, in which a given quantity of air is deprived of its aqeous vapour by means of sulphuric acid or other substance having great affinity for moisture, were conspicuous by their absence from both sections of the exhibition, though at one time they were much commended for use by meteorologists.

Of the three rain gauges exhibited, the first ("Howard's") is in a modified form, the rain gauge of the Englishman all the world over, while the other two—the "Crosley" and the "Side tube"—are fortunately dead and buried, though we hear of an occasional case of a misguided observer reverting to these archaic forms.

May we be forgiven for saying of the next class of instruments—"Anemometers"—that the whole science of anemometry is only just emerging from a state of barbarism worthy of the middle ages. But, thanks mainly to the modern apostle of anemometry, Mr. Dines, it is emerging.

The earliest anemometer in the catalogue is Lind's, "in which the force of the wind is shown by the depression and elevation of a column of water." This is the principle adopted by Mr. Dines in his latest pattern, the pressure tube anemometer. Of the remaining anemometers we would only say—*De mortuis nil nisi bonum.*

The list of 1837 instruments terminates with Herschel's actinometer, but there is no actinometer in the 1897 list. Have meteorologists given up using this instrument, or is it the fact that they never did use it?

Of the modern instruments we have little to say, they provide a delightful display of inventive genius and high-class workmanship, and make the amateur meteorologist long for unlimited cash to purchase, and time to use, the varied apparatus designed for wresting nature's secrets from her.

The Society itself exhibited a completely equipped meteorological station, necessarily substituting green baize for grass. We noticed in front of the thermometer screen a beautifully painted footboard for the observer. Do not the instructions say that the screen should be surrounded by grass?

It would be wearisome to give even a condensed list of the exhibits, and we will content ourselves with a few which had most interest for us, freely admitting that our selection probably has little to commend it to others.

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"127. *Seismograph* as arranged by Prof. J. Milne, F.R.S., for recording earthquakes, earth-tremors, &c. *Exhibited by* L. P. CASELLA, F.R.Met.Soc."

This appealed to our mechanical taste as a well designed, well arranged, and well made piece of apparatus.

"149. *Set of Meteorological Curves having reference to the gale of March 3rd*, 1897, comprising—

1. For Falmouth. Barograms, Thermogram, Anemograms, and Rainfall Curves.
2. For the Scilly Islands. Pressure Tube, Anemograms, and Aneroidogram.
3. For London. Aneroidogram with open scale.
4. Two Weather Charts showing the systems prevailing over the British Islands at 8 a.m. on March 3rd and 4th."

giving opportunity for a very interesting comparison of the various meteorological elements during a gale of exceptional severity.

"156. *Photograph showing the fixing of a 70 ft. Earth Thermometer* at Col. Knight's Observatory, Harestock, Winchester."

"138. *Case of Earth Thermometer* used at Harestock, Winchester. *Exhibited by* COL. H. S. KNIGHT, F.R.Met.Soc."

From the above, and from other information which has come to our knowledge, we believe that the problems of earth temperature have never been attacked with the same amount of thoughtful care and elaborate instrumental equipment as Col. Knight is devoting to them.

"155. *Photographs, Drawings, and Charts, illustrating the use of Kites* for obtaining meteorological records in the free air. *Exhibited by* A. L. ROTCH, F.R.Met.Soc."

Our last entry relates to a subject which remained almost dormant during the first fifty years of the Queen's reign, but is now receiving the attention which it deserves.

We must pass over numbers of beautiful photographs, only mentioning some of frost on window panes which showed charming specimens of nature's handiwork.

Mr. W. H. Dines, F.R.Met.Soc., showed an experiment illustrating the Formation of a Tornado Cloud. A tornado, waterspout, or whirlwind is one of those phenomena which cannot be seen every day, and when it does occur, observers are too often busy in securing their property, and therefore unable to study it; but by Mr. Dines's apparatus, the verisimilitude of a small tornado can be examined at leisure.

RAINFALL AT MUSWELL HILL.

To the Editor of the Meteorological Magazine.

SIR,—The rainfall of the 7 months, Sept. 1st, 1896, to March 31st, 1897, has been so excessive, that it may be interesting to compare it with past years.

A record of R for a quarter of a century was completed there on

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December 31st last; during that time, once only, just 20 years ago, has the total R for the 7 months, Sept. 1st to March 31st, exceeded that of the same period in 1896-7. In 1876-7 the aggregate for those 7 months was 24·63, being 8·09, or nearly 49 per cent. above the 25 years' average (16·54); while in 1896-7 it was 23·37, being 6·83 or 41¼ per cent. above the average.

	1872-3.	1876-7	1880-1	1882-3	1885-6	1896-7	Average for 25 years.
	in.	in.	in.	in.	in.	in.	in.
Sept. ...	1·71	3·82	3·76	3·06	4·76	6·26	2·47 .. Sept.
Oct.	5·80	1·22	5·36	5·53	3·90	3·06	3·15 ... Oct.
Nov. ...	4·09	3·46	2·11	3·10	3·67	1·12	2·80 ... Nov.
Dec.	4·79	6·63	3·40	2·91	1·22	4·05	2·41 ... Dec.
Jan.	2·66	5·01	1·29	2·50	4·72	2·23	2·14 ... Jan.
Feb.	2·38	1·80	4·03	3·95	·65	3·02	1·77 ... Feb.
March ...	1·80	2·69	2·31	·91	1·73	3·63	1·80 ... March
	23·23	24·63	22·26	21·96	20·65	23·37	16·54
Excess above Average	6·69	8·09	5·72	5·42	4·11	6·83	

During the 25 years there have been only five previous instances when the rainfall of those 7 months exceeded 20 inches, and the table appended gives the totals of each month on these occasions. In 1876-7 the excess was, in a great measure, due to the enormous amounts of December and January; while in 1896-7, September, December and March contributed most largely to the result.

Yours truly,

J. W. SCOTT.

Elleray, Etchingham Park, Finchley, N., April 3rd, 1897.

REVIEWS.

On Periodicity of Good and Bad Seasons. By H. C. RUSSELL, B.A., C.M.G., F.R.S. (Proc. R. Soc. New South Wales, June 3rd, 1896.) 8vo, 47 pages, 1 plate.

THIS paper opens with the following paragraph:—

"I feel some reluctance in coming forward to night, with the results of my investigations into the periodicity of good and bad seasons—floods and droughts if you will—because they must come to you as a surprise, and they will make a claim on your confidence, which at first sight you will probably not be disposed to grant. For myself, I know that some years ago, if anyone had come to me, stating that it was possible to forecast the seasons many years in advance, I should have received the statement with incredulity. It will not be a surprise to me therefore if you feel the same, but I hope you will give a fair hearing before coming to a conclusion, so that you may have before you the evidence that has convinced me, and you can then form your own opinions."

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We can hardly describe fully the laws which Mr. Russell thinks that he has established, but broadly we should state them as follows:—

(1) A recurrence of similar weather each 19 years; (2) If representing good seasons (which seems to mean wet ones) by the letter G, and bad ones (which are droughty ones) by B, there should be a normal sequence, but his own table does not show it.

Well, our opinion is that Mr. Russell has not proved his case. We shall be delighted to be convinced that we are wrong, because the discovery of any definite rule respecting coming seasons would be a priceless boon to the human race, and—compared with it—the discomfiture of the Editor of the *Meteorological Magazine* would not be of the slightest consequence. We cannot analyze and criticize 47 pages in two. The only thing to do is to indicate what we think has unconsciously led astray so able a man as Mr. Russell.

The first and great mistake seems to be that the author has not laid down a definition of what constitutes a good or a bad season. On page 3 he mentions "a period of months or years during which little rain falls, and the country gets burnt up." Yes, but what is "little rain," how much "burning up" is involved. And on the very next page we read "Drought is not wholly made by a shortage of rainfall. Its most important factors are great heat and drying winds." Here again we have an absence of definition; what is the precise meaning of "great heat," and what is the humidity and velocity constituting a "drying wind." These questions may seem puerile, but we believe that without sharp definitions of this kind, no two persons going independently through a 30 years meteorological register would take out droughts beginning and ending at similar times; and if this is true where we have a perfect statistical record as our basis, how much stronger does it become when we have only old chroniclers upon which to rely.

Then the diagram is novel, it goes from 1788 to 1895, and every year is "classed as good or bad, that is, having sufficient or insufficient rainfall," and moreover—as the author tells us on the previous page—"*without regard to their* (*i.e.* the droughts) *intensity.*" This is quite new—a diagram with no such thing as an average year, though rather oddly no characters are assigned to 1855–56. We have tried to find out how the diagram has been constructed, and give the figures for the first ten years we tried:—

Years.....	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879
Total R at	64·2	52·3	37·1	73·4	63·6	46·2	45·7	59·7	49·8	63·2
Sydney ...	+	—	—	+	+	—	—	+	—	+
Character in Diagram..	G	G	B	G	G	B	B	B	G	G

Roughly, the years with large totals are marked Good, those with small ones Bad; but 1877 and 1878 seem reversed. But we are not yet sure that we are on the right track, because from the diagram and from the nature of things it seems that the droughts are reckoned independently of the civil year. And if so, would two students

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start with the same month? Moreover, what becomes of the multiples of the odd months in relation to the 19 years period?

Then Mr. Russell works in records of red rain, gales, cyclones, and great frosts, but at present we are inclined to wait for the strong test of futurity. Sometimes we are puzzled to know at what the author is driving; for instance, on the last two pages we read of storms and famines in Cook's Island "About 1813," "In December, 1831," "In March, 1846," and "On March 27th, 1866." We do not see the 19 year cycle in these dates—1813-31 = 18; 1831-46 = 15; 1846-66 = 20; moreover, we find in the diagram 1813B, 1831G, 1846B, 1866B.

However, Mr. Russell is so able, and has done such good work for New South Wales, that we hope that it is only our obtuseness which prevents our being convinced. Probably the curve of the dividends of the Colonial Banks will afford a fair commentary on the predictions which are, Good for 1897-8, 1901-2, and 1906; and Bad for 1899-1900, and 1903 to 1905.

Buletinul Observatiunilor Meteorologice din Romania de STEFAN C. HEPITES, Directorul. Anul V., 1896. Bucuresci, 4to., 1897.

WE are glad to see that Director Hepites is advancing rapidily with the organization of the meteorological service for Roumania, and that, as regards promptitude of publication, he is showing the Directors of Western Europe an example. This pamphlet contains chiefly the monthly summaries of the 34 climatological and 309 rainfall stations which he has established, but in the first place he must be congratulated on their number, and secondly upon the promptitude which has enabled him to give us the complete totals for the year—within three months of its closing. We hope that at an early date Dr. Hepites will give a map showing the position of all his stations. Meanwhile we may just mention that the rainfall during 1896 over Roumania seems to have been generally about 16 inches and the following appear to have had the greatest and least rainfall:—

	Lat.	Lon.	Altitude.	RAIN in 1896. Total. in.	M. in 24 hrs. Depth. in.	Date.	Days with .04 or more
Domnesci, Muscel	45° 9′ N.	24° 53′ E.	1640ft.	53·78	2·96	10 vi.	84
Mangalia, Constanta...	43° 37′ N.	28° 37′ E.	105ft.	6·46	1·09	16 xii.	28

Annales de l'Observatoire Météorologique du Mont Blanc (Altitude 4,358 mètres = 14,298 ft.) Publiées sous la Direction de J. VALLOT, Fondateur et Directeur de l'Observatoire. Tome II avec 7 Planches et 19 Figures. 4to. Steinheil, Paris 1896.

ON a previous occasion, *Met. Mag.*, Vol. XXX (1895), pp. 9-10, we had great pleasure in calling attention to the splendid work being done by M. Vallot at great cost of money, of time, and of strength in the building, equipping and maintaining this loftiest of European

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meteorological stations. We are glad to welcome the second of his valuable volumes of *Annales*, and we congratulate M. Vallot on the very fair, and yet appreciative, report upon his work made by the reporters of the *Académie des Sciences* (as they were MM. Mascart, Bouquet de la Grye and Daubrée it is not easy to see how the author could have more competent judges). The following is a free translation of the concluding sentence of their report :—

"This short note will sufficiently show that in pursuit of his object M. Vallot has had to conquer many difficulties, sufferings and dangers. He has carried out the whole without any government assistance and entirely at his own expense. This savant deserves all credit for his energy, his perseverance and his devotion to Science."

Reference to our previous review will show how thoroughly we agree with the above statement.

The present volume deals chiefly with barometric records, actinometric observations and the triangulations necessary for M. Vallot's survey of Mont Blanc on the scale of rather more than three inches to the mile. One paper of 24 quarto pages, devoted to difficulties of scientific observations at great altitudes, is extremely interesting. In fact it is a sort of epitome of the author's experiences, and as he tells us that he has made 22 ascents, and has on one occasion remained nine consecutive days at his lofty observatory, his experience is unique. We are sorry to infer from one expression that the severe strain produced by the climbing, the deficiency of oxygen, and the low temperature have somewhat impaired M. Vallot's health, it would have been wonderful if that were not the case, but he is as energetic as ever and promises a third volume at an early date. France may well be proud of such a worker.

Report and Results of Meteorological Observations made at Ardgillan, Co. Dublin during the year 1896, by CAPT. E. R. TAYLOR, F.R.Met.Soc. Privately printed, 4to., 1897. London. 23 pp., 1 plate. The same for 1892. 4to., 1897, 6pp.

CAPTAIN TAYLOR has in these two pamphlets given in a very clear and compact form the results of his station—so clear indeed that there is scarcely any room for criticism. If we had had a sea level pressure of 31·043 inches to record, we think that we should not have passed it over so lightly as the author has done on p. 14. It is never safe to prophecy, but judging by the past it will probably be 50 or 100 years before such a fact has to be recorded again. Then on page 3 he tells us that there are at Ardgillan two rain gauges, an 8-inch and a 5-inch, but we cannot find the result of the former, although from the pamphlet for 1892 it is evident that it, the 8-inch gauge, was the first erected.

Another welcome addition to the pamphlet for 1897 will be a view of the station showing the position of the instruments, or a scale plan of the ground such as used to be given by the Royal Meteorological Society.

The smaller pamphlet for 1892 is welcome, as it contains the results for the first year for which records exist.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, OCTOBER, 1896.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	62·9	8, 9	29·2	28	53·6	40·5	41·5	84	100·6	24·8	3·05	18	6·2
Malta	84·1	2	56·6	27	76·5	62·7	63·2	81	134·8	50·3	2·50	4	6·5
Mauritius	82·6	13	63·0	9	79·5	67·3	62·9	73	138·2	54·0	·54	14	5·4
Calcutta	91·7	5	69·4	21	88·8	73·0	69·9	69	152·5	62·0	·00	0	1·0
Bombay	95·0	29	76·6	31	90·2	78·7	75·7	76	141·3	63·6	·01	1	1·1
Ceylon, Colombo	89·8	29	72·0	29	86·5	74·8	74·0	84	145·0	69·0	16·78	23	7·0
Melbourne	89·5	28	36·9	2	68·5	47·5	47·7	70	139·5	29·0	·78	7	5·7
Adelaide	97·8	28	40·0	7	77·3	52·5	46·2	54	155·8	28·5	·34	7	3·8
Sydney	92·4	13	47·6	3	73·4	58·4	56·1	71	149·9	39·2	2·19	10	4·7
Wellington	65·0	26	34·0	1	58·9	46·9	42·5	68	130·0	27·0	3·18	16	4·3
Auckland	67·5	31	40·0	19	62·2	48·9	45·8	71	137·0	35·0	1·93	20	5·0
Jamaica, Kingston	92·8	21	71·3	23	89·7	74·1	...	...	...	...	·97	5	...
Trinidad	88·8	...	72·1	...	...	...	74·3	81	...	...	6·05	...	...
Grenada	88·4	19	72·0	14*a*	85·0	75·4	71·0	75	158·0	...	4·14	14	3·0
Toronto	66·8	29	27·8	26	52·4	37·4	38·1	75	83·0	23·0	2·16	11	6·3
New Brunswick, Fredericton	66·7	1	25·4	11	52·0	35·9	37·7	80	...	...	5·15	13	7·2
Manitoba, Winnipeg	73·6	2	13·4	21	48·7	26·4	...	...	...	...	1·01	7	6·2
British Columbia, Esquimalt	65·5	15	35·2	27	56·1	42·5	46·0	92	...	...	2·87	12	6·2

a—and 26.

REMARKS.

MALTA.—Adopted mean temp. 69°·1, or 0°·4 below the average. Mean hourly velocity of wind 8·0 miles. Average temp. of sea 73°·5. Thunderstorms on 1st, 2nd, 3rd and 5th. Lightning on 5 days; hail on 3rd. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·8 above, of dew point 1°·1 above, and rainfall 1·09 in. below, their respective averages. Mean hourly velocity of wind 9·8 miles, or 1·4 below average; extremes, 20°·2 on 4th and 29th, and 2·0 on 9th; prevailing direction, E.S.E. The driest October on record, with the exception of 1878. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 14 days; lightning was seen on the 29th. F. W. GRIMLINTON.

Adelaide.—Mean temp. 2°·9 above the average of 39 years. Another very dry month, the total fall being 1·52 in. below the average for 39 years, and the least but one on record for this month. C. TODD, F.R.S.

Sydney.—Rainfall ·67 in. below, temperature 2°·4 above and humidity 1°·6 above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery in the early part of the month, wind chiefly S.E.; the middle of the month generally fine. On night of 23rd severe thunder and rain storm from N.W., causing damage; 1·20 in. of rain falling between 7 and 8 p.m. The remainder of the month unsettled. Prevailing wind N.W., frequently strong. Hail on 2nd. Mean temp. 0°·7 below, and rainfall 1·19 in. below, their respective averages. R. B. GORE.

Auckland.—A cold and windy month, with an unusual predominance of S.W. winds. Mean temperature and rainfall considerably below the average. T. F. CHEESEMAN.

JAMAICA.—Mean hourly velocity of wind 2·8 miles. Kingston rainfall one-eighth of the average. Island rainfall eleven per cent. below the average. R. JOHNSTONE.

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SUPPLEMENTARY TABLE OF RAINFALL, MARCH, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	3·41	XI.	Rhayader, Nantgwillt ...	7·92
II.	Dorking, Abinger Hall.	5·66	,,	Lake Vyrnwy	8·11
,,	Birchington, Thor	3·10	,,	Corwen, Rhug	...
,,	Hailsham	4·51	,,	Criccith, Talarvor..... ...	3·66
,,	Ryde, Thornbrough	5·20	,,	I. of Man, Douglas	4·81
,,	Emsworth, Redlands ...	4·16	XII.	Stoneykirk, Ardwell Ho.	4·86
,,	Alton, Ashdell	6·04	,,	New Galloway, Glenlee	8·57
III.	Oxford, Magdalen Col..	2·59	,,	Lilliesleaf, Riddell	3·72
,,	Banbury, Bloxham	4·04	XIII.	N. Esk Res. [Penicuick]	4·75
,,	Northampton, Sedgebrook	3·67	,,	Edinburgh, Blacket Pl..	2·87
,,	Duddington [Stamford].	2·91	XIV.	Glasgow, Queen's Park..	4·05
,,	Alconbury	1·84	XV.	Inverary, Newtown	7·96
,,	Wisbech, Bank House...	2·12	,,	Oban, The Corran	7·88
IV.	Southend	3·19	,,	Islay, Gruinart School ...	1·97
,,	Harlow, Sheering..... ...	3·74	XVI.	Dollar.....	5·47
,,	Colchester, Lexden	2·97	,,	Balquhidder, Stronvar...	11·12
,,	Rendlesham Hall	2·00	,,	Ballinluig	5·85
,,	Rushall Vicarage	2·66	,,	Dalnaspidal H.R.S.....	9·70
,,	Swaffham	2·76	XVII.	Keith H.R.S.....	4·13
V.	Salisbury, Alderbury ...	4·82	,,	Forres H.R.S.	1·41
,,	Bishop's Cannings	4·06	XVIII.	Fearn, Lower Pitkerrie..	1·97
,,	Blandford, Whatcombe.	5·51	,,	N. Uist, Loch Maddy ...	6·16
,,	Ashburton, Holne Vic...	7·08	,,	Invergarry.....	5·29
,,	Okehampton, Oaklands.	5·57	,,	Aviemore H.R.S.	2·12
,,	Hartland Abbey	4·89	,,	Loch Ness, Drumnadrochit	2·65
,,	Lynmouth, Glenthorne.	6·52	XIX.	Invershin	5·34
,,	Probus, Lamellyn	4·48	,,	Scourie	3·90
,,	Wellington, The Avenue	5·01	,,	Watten H.R.S.....	2·63
,,	Wincanton.....	4·17	XX.	Dunmanway, Coolkelure	11·29
VI.	Clifton, Pembroke Road	4·20	,,	Cork, Wellesley Terrace	5·57
,,	Ross, The Graig	3·81	,,	Killarney, Woodlawn ...	7·40
,,	Wem, Clive Vicarage ...	2·63	,,	Caher, Duneske	5·52
,,	Cheadle, The Heath Ho.	2·77	,,	Ballingarry, Hazelfort...	5·00
,,	Worcester, Diglis Lock	3·11	,,	Limerick, Kilcornan ...	4·49
,,	Coventry, Kingswood ...	3·09	,,	Broadford, Hurdlestown	...
VII.	Grantham, Stainby	2·49	,,	Miltown Malbay	6·45
,,	Horncastle, Bucknall ...	2·07	XXI.	Gorey, Courtown House	4·59
,,	Worksop, Hodsck Priory	2·44	,,	Athlone, Twyford	4·91
,,	Neston, Hinderton	2·01	,,	Mullingar, Belvedere ...	4·22
VIII.	Southport, Hesketh Park	2·84	,,	Longford, Currygrane...	3·76
,,	Broughton-in-Furness ...	7·64	XXII.	Woodlawn	5·34
IX.	Ripon, Mickley.....	4·66	,,	Crossmolina, Enniscoe ..	8·03
,,	Melmerby, Baldersby ...	3·01	,,	Collooney, Markree Obs.	6·60
,,	Scarborough, Observat'y	2·66	,,	Ballinamore, Lawderdale	6·39
,,	Middleton, Mickleton ...	5·66	XXIII.	Lough Sheelin, Arley...	...
X.	Haltwhistle, Unthank...	5·53	,,	Warrenpoint.....	5·74
,,	Bamburgh	3·04	,,	Seaforde..	4·73
,,	Keswick, The Bank.....	8·02	,,	Belfast, Springfield	5·65
XI.	Llanfrechfa Grange	5·58	,,	Bushmills, Dundarave..	4·19
,,	Llandovery	6·89	,,	Stewartstown	4·15
,,	Castle Malgwyn	6·13	,,	Killybegs	9·70
,,	Builth, Abergwesyn Vic.	9·25	,,	Lough Swilly, Carrablagh	7·02

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MARCH, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	3·42	+ 1·81	·49	2	17	61·7	23	26·8	30	3	14
II.		Maidstone (Hunton Court)...	...	...	...	...	...	...	...	...	...	...	...
,,		Strathfieldsaye	4·65	...	·57	2	21	...	...	...	...	...	...
III.		Hitchin	4·13	+ 2·79	·65	2	19	61·0	21	26·0	29	6	...
,,		Winslow (Addington)	2·97	+ 1·25	·66	17	19	65·0	21	24·0	30	7	11
IV.		Bury St. Edmunds (Westley)	2·73	+ 1·18	·59	2	15	61·0	22	31·0	30	...	...
,,		Norwich (Brundall)	2·33	...	·46	2	17	62·0	21	27·8	13	5	12
V.		Weymouth(LangtonHerring)	4·51	+ 2·61	·76	2	21	57·0	31	33·0	30	0	...
,,		Torquay (Cary Green)	5·89	...	1·52	2	18	58·6	19*b*	35·0	5, 30	0	5
,,		Polapit Tamar [Launceston]..	3·89	+ 1·36	·59	2	22	58·1	27	29·9	30	2	4
VI.		Stroud (Upfield)	3·60	+ 1·41	·77	2	20	67·0	26	31·0	7, 29	2	...
,,		ChurchStretton(Woolstaston)	3·76	+ 1·63	·51	17	24	57·0	22*c*	29·0	30	9	20
,,		Tenbury (Orleton)	3·44	+ 1·36	·72	2	21	63·8	21	24·0	30	5	10
VII.		Leicester (Barkby)	2·10	+ ·39	·46	14	21	64·0	21	22·0	29	10	19
,,		Boston	1·82	+ ·28	·36	14	17	60·0	21	28·0	13	6	...
,,		Hesley Hall [Tickhill].....	2·47	+ ·57	·50	2	20	61·0	21	25·0	30	6	...
VIII.		Manchester(PlymouthGrove)	2·61	+ ·39	·40	3	20	62·0	22	27·0	30	3	7
IX.		Wetherby (Ribston Hall) ..	...	...	...	...	...	...	...	...	...	...	...
,,		Skipton (Arncliffe)	9·89	+ 4·79	1·42	4	24	...	...	...	...	...	...
,,		Hull (Pearson Park).	2·93	+ ·88	·40	2	18	59·0	21	21·0	30	9	10
X.		Newcastle (Town Moor)	2·96	+ ·33	·38	14	19	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	19·99	+ 9·49	1·91	2	28	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	4·39	+ 1·41	·66	2	24	...	...	...	...	...	...
,,		Haverfordwest	5·75	+ 2·51	1·02	2	26	55·1	25	28·1	30	2	9
,,		Aberystwith (Gogerddan) ...	5·46	+ 2·48	1·46	2	21	61·0	23	...	..	...	...
,,		Llandudno.....	2·92	+ ·84	·46	12	19	62·0	22	34·5	8	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	5·91	+ 2·61	·86	2	22	56·0	23	23·4	30	6	...
,,		Jedburgh (Sunnyside).....	...	...	...	...	...	...	...	...	...	...	...
XIV.		Colmonell	6·32	...	·62	3	24	59·0	21	21·0	31	...	...
XV.		Lochgilphead (Kilmory)	6·11	+ 1·65	·70	22	27	...	...	21·0	30	10	...
,,		Mull (Quinish).....	7·55	+ 3·71	·96	22	22	...	...	...	...	...	...
XVI.		Loch Leven Sluices	5·50	+ 2·53	1·00	23	20	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	3·60	+ 1·20	·65	15	25	58·0	24	25·7	30	8	...
XVII.		Braemar	5·92	+ 3·28	·94	13*a*	26	51·8	24	18·6	3	14	22
,,		Aberdeen (Cranford)	3·91	...	·60	13	26	58·0	24*c*	24·0	28	8	...
,,		Cawdor (Budgate)	1·89	— ·15	·29	22	25	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	6·18	+ 1·86	·68	17	15	...	...	...	...	...	...
,,		Glencarron Lodge.....	7·40	...	1·00	18	30	52·1	22	20·6	31	13	...
XIX.		Dunrobin	3·68	+ 1·43	·53	22	25	54·0	24	26·0	30	6	...
,,		S. Ronaldsay (Roeberry).....	4·01	+ 1·47	·55	26	28	50·0	21	26·0	29*e*	12	...
XX.		Darrynane Abbey.....	6·40	...	·77	27	26	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	5·91	+ 3·01	1·12	11	23	58·5	24	29·0	30	3	...
,,		O'Briensbridge (Ross)	4·80	...	·94	11	20	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	4·75	+ 2·38	·98	2	22	...	..	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·98	+ ·97	·74	11	24	61·6	21	29·0	30	1	9
XXII.	IRELAND.	Ballinasloe	4·75	+ 2·12	·79	11	28	58·0	22	30·0	30	7	...
,,		Clifden (Kylemore)	10·68	...	1·09	2	26	...	...	...	...	...	...
XXIII		Waringstown	5·38	+ 3·03	·78	27	26	59·0	24*d*	21·0	29	11	17
,,		Londonderry (Creggan Res.).	5·05	+ 2·32	·99	4	27	...	...	...	...	...	...
,,		Omagh (Edenfel)	5·44	+ 2·93	·70	11	26	56·0	21	24 0	29	7	17

+Shows that the fall was above the average ; —that it was below it.

a—and 15. *b*—and 24. *c*—and 26. *d*—and 25. *e*—and 30.

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METEOROLOGICAL NOTES ON MARCH, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

HITCHIN.—The wettest March in our record, which began in 1850, excepting 1864, when 4·14 in. of R fell.

ADDINGTON.—A month of very unsettled weather, with frequent very high winds. Thunder was heard on the 10th, 15th and 17th; on the 15th there was a rainbow at 7 a.m., and again at 4 p.m.; on the 17th there was much L at night. The morning of the 30th was very cold, the shade temp. falling to 24°. Brook overflowing on 3rd. Only twice during 27 years has the rainfall been exceeded in March—to wit, 1876, 3·60 in., and 1888, 2·99 in.

BURY ST. EDMUNDS, WESTLEY.—A mild month, with high winds. Vegetation very forward. TS, with H, on 4th; S and R on 31st.

NORWICH, BRUNDALL.—A windy, but mild month. Mean temp. 44°·9, constituting the fifth March in succession with temp. higher than the average. Between the 17th and 28th the thermometer did not once fall to 40°, and on two nights the min. was as high as 47°. R of month ·61 in. above average. T on 4th and 18th. Squally, with H, on 1st; gales on 3rd and 19th.

WEYMOUTH, LANGTON HERRING.—The previous heaviest rainfall in March in 23 years was in 1891, 3·58 in., which is ·93 in. less than that of the present month. For the first three months of this year the rainfall is 4·05 in. in excess of the average, and is ·56 in. more than in the next highest. The average temp. at 9 a.m., 44°·4, is 2°·7 above the average of 26 years. Between 8 and 9 a.m. on the 3rd occurred the most destructive storm remembered here; trees were uprooted in all directions, and slates and tiles blown off in great numbers. A severe TS occurred on the evening of the 17th. Solar halos were seen on the 2nd, 9th and 27th; and lunar halos on the 12th and 13th. Constant fogs from 20th to 25th.

TORQUAY, CARY GREEN.—Rainfall 3·47 in. above the average. Mean temp. 46°·7, or 2°·8 above the average. Duration of sunshine 136 hours 50 minutes, being 8 hours 30 minutes below the average. No absolutely sunless day.

POLAPIT TAMAR [LAUNCESTON].—A wet month. The first half of the month was cold and stormy. The average shade temp. rather less than that of February. T, L and H on 4th; T and H on 16th; and T on 17th. S.W. gale on 2nd.

STROUD, UPFIELD.—S.W. gale on night of 2nd, and N.W. gale all day on 3rd, with S and sleet; and S.W. gale on 4th. T and H on 10th. S.W. gale on 11th. Sharp TS at 7.30 p.m. on 17th. S.W. gales on 26th and 28th. S on the hills on 31st.

WOOLSTASTON.—A cold, wet, and stormy month. Heavy gales, with S storms, on 2nd, 3rd, and 11th. S on the 30th and 31st. Mean temp. 42°·8.

TENBURY, ORLETON.—A warm, wet month; in fact, the wettest March since 1867. All vegetation very forward, but severe frost on the 30th checked it considerably. T and L on the evening of the 17th.

LEICESTER, BARKBY.—A month of great barometrical fluctuations and very high winds, even for March; almost all "Lion" and no "Lamb." Mean temp. 44°·4. Thunder on 10th and 17th. S on 31st.

ARNCLIFFE VICARAGE.—Very wet, with much wind, and less S than usual.

HULL, PEARSON PARK.—TS on 4th; squally, with H, on 16th. T on 18th. Squally, with H showers, on 26th.

WALES.

HAVERFORDWEST.—I cannot find a record of a wetter March than this since the commencement of observations in 1849. It commenced with very stormy

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weather and low temp. A gale of great energy, after a day of storm and heavy rain, sprang up at 0.30 a.m. on the 3rd, accompanied by H and S showers; some squalls being of exceptional violence, especially one at 6.30 a.m., and several large trees were uprooted. Prevailing winds were from S., S.W., W., and N.W. The month ended as it began, stormy. Vegetation very forward.

ABERYSTWITH, GOGERDDAN.—Very stormy throughout the month. Snowstorms on the 2nd and 3rd, with strong wind from S.W.

SCOTLAND.

CARGEN [DUMFRIES].—Absence of sunshine, Easterly winds, and almost incessant rainfall combined to make the month the most unpleasant on record. Barometrical pressure only on one day (7th) exceeded 30 inches, and, with the exception of the mean reading in 1862, is the lowest recorded in March at this station. The temp. has been 1° above the average, but never have there been more wet days, while the total rainfall has only once (in 1868, when the exceptional figure 8·14 in. was registered) been exceeded. S fell almost continuously during the afternoon and night of 30th. A severe gale blew from S. on 22nd. The number of hours of sunshine recorded has only once been smaller. Farm work was very much retarded.

COLMONELL.—Rainfall 2·99 in. above, and mean temp. 2°·1 above the average of 20 years. H shower on 1st; soft S on 3rd; S, sleet, and H on 4th.

BRAEMAR.—The old saying in March, "In like a Lion and out like a Lamb," was falsified this year. It may be said here, In like an angry Lion, and out like a fierce Lion. Roaring winds, with snow and drift.

ABERDEEN, CRANFORD.—The month was very cold, with high winds.

S. RONALDSAY, ROEBERRY.—A very cold, wet month. Mean temp. of the month, 38°·8.

IRELAND.

DARRYNANE ABBEY.—The first half very wild and cold; the second half mild but stormy. The wettest March registered. H showers on 2nd, 3rd and 4th.

WATERFORD, BROOK LODGE.—A very wild and wet month. The wettest March for about 50 years. H on 1st, 4th, 10th and 15th. S showers on 3rd, 10th and 12th. L on 4th, 5th and 17th. Thick fog on 19th, 20th, 21st, 22nd, 23rd and 25th. Gale from S.W. on 26th. Water in screen frozen on 29th.

O'BRIENSBRIDGE, ROSS.—This was the third bad March in succession, and the worst of the three.

DUBLIN.—Like March, 1896, this was a changeable, wild, and rainy month. During the first half temp. was low. A warm spell followed, but temp. again fell briskly on the 28th, and the month closed cold and ungenial. Compared with February, the mean temp. showed a falling off of one degree. Notwithstanding, the progress of vegetation was very rapid, and on the last day the trees presented quite a vernal appearance. Mean temp., 45°·2, 2°·1 above the average. Foggy on two days. High winds were noted on 20 days, reaching the force of a gale on 9. S or sleet occurred on 6 days, and H on 7 days. Solar halos on 5 days. Lunar halos on 3 days. T on the 17th. L on the 1st and 3rd.

WARINGSTOWN.—Unusually wet. Spring rather early, but labour backward.

OMAGH, EDENFEL.—A month of almost continuous gales and rain, the total fall exceeding by ·97 in. the next wettest March (1868) since the records commenced in 1865. As a result the saturation of the soil prevented spring sowings of all kinds, and farm labour is backward almost beyond precedent. Temp., however, was sufficiently high to promote considerable vegetation, especially in trees, until checked by the sharp frosts of the last week.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXVI.] MAY, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

Louis Pascal Casella.

1809—1897.

IT is but a few years since Mr. Casella retired, and few of those who saw him during the closing years of his business life would have thought that he was then well beyond the "fourscore years."

It is only since his death that we have heard that his second name was not Philip, but Pascal, and that it was supposed to be a family name. There seems little chance of now verifying the tradition, but it is a curious coincidence that the deceased, whose name will not soon be forgotton by meteorologists, should have borne also the honoured name of Pascal. Moreover, it is strange that Mr. Casella's Italian parent should have given his son the French name. Although Mr. Casella's father was by birth and parentage an Italian, he had resided in Edinburgh during the latter part of the 18th century, and he and his son removed to London only about 1835. Shortly afterwards the son joined the late Mr. Tagliabue as an instrument maker; he married his daughter, and half a century ago succeeded to the business, which at that time was extensive rather than scientific. Long before that time Mr. Casella had become a member of the original Meteorological Society, and, whether as a cause or as a consequence we know not, but, as a fact, Mr. Casella has chiefly been known as a maker of high-class instruments for meteorologists and travellers. As the business is being continued by one of the sons we think it best to leave the father's work to stand upon its own merits; but there was one feature in Mr. Casella's character which, now that he has passed beyond human praise, ought to be mentioned: his kindliness of disposition was well-known, but far more noteworthy was his benevolence to those who were in need.

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HAILSTORM IN SOUTH LONDON.

To the Editor of the Meteorological Magazine.

SIR,—The storm of the 27th ult. having apparently been peculiar to this locality, I venture to think that some notes upon it may be of interest to you. Commencing at 6.30 p.m., the hail fell so thickly that the ground was soon covered to a considerable depth, bearing a resemblance to a heavy snowfall. A great deal of damage accrued to fruit trees, the partly "set" fruit of the pear and plum being cut off completely, and early rose-trees stripped of leaves and buds. The hail was followed by heavy rain, which, being unable to escape down the gutters and drains through the mass of hailstones which choked them, flooded the houses. doing not a little damage. The hailstones were of a large size and divers shapes, one which I picked up measuring half-an-inch square, but being soft, they did little damage to glass. The storm lasted one hour, and on measuring the rain at its conclusion the amount in the gauge was found to be 1·18 inches. I am informed by an "old inhabitant" that it is necessary to go back to August, 1846, for a parallel hailstorm in this neighbourhood. You will probably receive many letters on the subject, and it will be interesting to note how far the storm extended; as, from what I can gather, the area affected by it was very small, and the rainfall very variable even within that limit.

I am, Sir, yours faithfully, D. W. HORNER.

Clapham Park, S. W., May 1st, 1897.

[Our correspondent is correct in referring to the great storm of August 1st, 1846; but that was far more serious than the one in 1897, giving the tremendous rainfall of 3·12 inches in 2 hours 17 mins. We do not think that any rain gauge recorded the full intensity of the recent storm; Mr. Horner's 1·18 in. is the highest, and that is by no means remarkable for a thunderstorm with hail—and at most stations in the neighbourhood, *i.e.*, in North Surrey, the fall was quite insignificant. The only returns of even half-an-inch which we have received are—

	in.		in.
Kingston	·60	Surbiton (Seething Wells)	·73
Brixton (Acre Lane)	·62	New Malden (Sewage Works)	1·02
Wimbledon (Sewage Works)	·68	Clapham Park (New Park Road).	1·18

and yet we know from the pierced leaves which Mr. Horner has sent us that the hail was serious, and from eye-witnesses that the following accounts are substantially correct]:—

HEAVY THUNDERSTORM IN SOUTH LONDON.

"A correspondent writes:—For many years I have lived in South London, but never have I experienced anything like the scene which was witnessed at the base of Brixton Hill during the prevalence of last night's thunderstorm. Taking it altogether, with rain and hail, there was not probably more than twenty or five-and-twenty minutes' downpour, but that sufficed to temporarily

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transform the appearance of the locality. The hill itself is a steep declivity—neither so high nor so steep, it is true, as that of Highgate—but a steady, persevering rise, starting at, say, the White Horse in the Brixton Road, and terminating a mile or a mile-and-a-half further south at Streatham Place. It is a broad thoroughfare, flanked by open gardens and shaded in many places by trees of respectable size and antiquity. The pavements are high-pitched, and the gutters are, consequently, relatively speaking, deep. Under the centre of the roadway itself run the two continuous tunnels through which the miles of tram cables run that draw cars and bogies from Kennington to Streatham. After the first few peals of thunder the hail began to pour down as though through some vast overhead sieve, and in a few minutes gutters were choked and lawns were covered for a depth of an inch or more. This was succeeded by rain of a semi-tropical character, and was followed a little later by a second storm of blinding hail. The hill was speedily converted into something like a cataract, the water running between the high kerb stones inches deep. Horses driven from the side streets refused to face it, and more than one driver had to get down and lead his frightened charge. It will scarcely be credited, but I actually saw a plank of timber merrily floating down the roadway. The southern tram traffic was first impeded, and then temporarily suspended, the bogies with their broad noses making heavy way 'up stream,' and throwing up water on each side as though they were snow ploughs driving through a drift. One lady I saw cross the main road, just at the base of the hill, had the water above her boot ankles, and I myself had to wade through inches of water to make my way to a belated tramcar which managed to make slow progress through the miniature sea because it was going citywards."—*Daily News.*

"Another correspondent writes:—A very curious experience happened to me yesterday. I had been spending the morning at a South Coast watering-place. It was to all appearance a perfect summer day—warm and balmy, with just wind enough to temper the sun. I left about half-past five, and as I entered the train, I noticed that the carriage was flooded with the sunshine, and it was necessary to draw down the blinds on one side. Then I lit a cigar, plunged into the *St. James's Gazette*, and for an hour or so forgot all about the weather. Suddenly, some time after we had passed Croydon, I looked out of the window, and almost shouted in my astonishment. An amazing spectacle greeted me. I had passed from summer to winter. The fields, the roofs, the roads, the railway-track, were all white with what seemed snow. I learnt afterwards that it was only hail, but to all appearance it was snow lying thickly on the ground, and the whole landscape was quite winterly."

St. James's Gazette.

ON THE WORSHIP OF METEORITES.

By the late PROFESSOR NEWTON.

THE January number of the *American Journal of Science* opens with an article written some years since by Professor Newton, but not previously published.

"In it the author has brought together a large number of facts showing the superstitious regard attached to meteorites from the

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very earliest times. The first case mentioned is that of the iron from an altar of an Indian mound in Ohio, which was preserved with other articles evidently regarded as of peculiar value. By some this iron is regarded as probably the same as that of which a number of masses were found about 1886 in Kiowa county, Kansas. Another case spoken of is that of the stone which fell at Ensisheim, in Alsace, 1492, which was preserved in a church at that place. A fall of stones some nineteen years later near Milan, in Italy, is also alluded to as having probably been the occurrence recorded by Raphael by the fireball in his picture of the Foligno Madonna now in the Vatican. The sacred stone of the Mohammedans preserved in the Kaaba of the mosque at Mecca is also mentioned as perhaps a case in which a meteorite has been selected for long continued worship. The author then goes on to discuss a number of instances recorded in classical literature, and, although it is impossible to say that in each case a meteorite was the object described, in many cases it seemed highly probable. The Palladium of Troy, the needle of Cybele, the original image of the Ephesian Artemis, are some of the cases which the author describes in detail with quotations from the original authorities.

"On a later page of the same number a description is given by Warren M. Foote, of a new meteoric iron from the Sacramento Mountains, in New Mexico. This is a typical siderite and weighed, as found, 237 kilograms (521 pounds). It shows the common octahedral structure with unusual distinctness. Two plates accompany the article, one showing the appearance of the iron itself, one-eighth the natural size, the other the Widmannstätten figures printed directly from an etched slab. As further bearing on the same subject is to be mentioned a catalogue of the meteorites in the Yale University collection, which forms an appendix to the number."—

Science.

THE FORMATION OF DEW.

By Dr. J. G. McPherson, F.R.S.E., Lecturer on Meteorology in the University of St. Andrews.

UNTIL very recently the exact constitution of the nature and formation of dew was unknown even to scientific men. The opinion was generally held that if you went through the glistening meadow on a summer evening, through the diamond drops sparkling in millions, you would get your trousers or your boots moistened with dew. It was also believed that dew fell from the air upon the ground. Now in both cases the opinion was wrong, for it was not dew at all which was encountered in the meadow, and dew does not fall from the air. If you look into the garden on a dewy night—for there is such a thing as dew for all that—you will find some plants moist. Glistening drops appear on the Brocoli, but the Peas are dry. Place a hand-lantern below one of the healthiest Brocoli leaves, and you will find that the moisture is collected in clear drops along the edge of the leaf and at the end of the veins of the leaf. The leaf

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veins radiating from the centre line of the surface have carried the moisture of the healthy plant to the edges to keep up plant circulation; and the drops you see are not dew drops, but the watery juices carried out by the energy of the healthy plant. For place the lantern under an unhealthy leaf, and you will find no drops; there is no circulating vitality in it. Again, examine grass blades, and you will find large drops near the tips of the blades, the rest of the blades being quite dry. The large drops seen on plants at night are falsely called dew; they are produced from the plants themselves as tokens of their active and healthy growth.

This can be demonstrated in more than one way. Remove a branch of Poppy and connect it by means of an indiarubber tube with a head of water of about 40 inches. After placing a glass receiver over it to prevent evaporation, leave it for three hours. Then you will find that water has been freely excreted through the veins, resembling what were familiarly called "dew drops." If the water pressed into the leaf is coloured with aniline blue, the drops when they first appear are colourless, but before they grow to any size the blue appears, showing that little water was held in the veins. What, then, has been for centuries called dew is not dew at all, but the watery juices of the healthy plants.

But look over dead leaves on a dewy night, and you will see a fine pearly lustre—that is dew. Dead matter gets equally wet when equally exposed, and real dew is not so common as is generally supposed. On many nights on which grass gets wet no true dew is deposited on it, and on all nights, when growth is healthy, the exuded drops always appear before the true dew. The difference between the true and the false dew can easily be detected. The moisture exuded from the leaf veins of the grass—false dew—is always isolated at points situated near the tips of the blades, forming drops of some size; whereas true dew collects evenly all over the blades. A glance distinguishes the pearly lustre of the dewy film from the glistening diamond drops of the healthy plant's juices.

But whence comes the dew? It does not fall from the air. Whence comes it, then? We shall see. Ground a little below the surface is always warmer than the air over it. As long, then, as the surface of the ground is above the dew point, vapour must rise and pass from the land into the air. The moist air so formed will mingle with the air above it, and its moisture will be condensed, forming dew wherever it comes into contact with a surface cooled below the dew point. In fact, dew rises from the ground.

Place some metal trays over the grass, the soil, and the road on dewy nights. You will generally find more moisture on the grass inside the trays than outside; you will always observe a deposit of dew inside the trays, even when there is none outside at all. This shows that far more vapour rises out of the ground during the night than condenses as dew on the grass and other objects.

Pieces of iron lying on grass are soon surrounded with richer grass, on account of the moisture which the cold metal attracts from the rising water-vapour. Travellers in Australia and South Africa state that they often found the under side of their waterproof bedding placed on the ground to be wet after camping out at night. That shows that even in dry countries vapour rises from the ground at night, I remember, when walking in the vicinity of Hexham with an acute observer, trained to farming, that, on my remarking that the farmers might to their profit remove the extraordinary quantity of

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small stones from the fields in order to give room for the growth of the grain, he shrewdly said, "These stones collect moisture from the ground; the soil is thin, with a gravelly subsoil, and unless the maximum amount of moisture be collected (which can only be done by allowing these stones to remain), there would be a very deficient crop. They must not therefore be removed."

Dew, then, rises from the ground. But how is the dew formed on bodies high up in the air? If the dew comes out of the ground, should it not be found on bodies only exposed to the earth? Now, dew does not rise in particles, as it was once considered to fall in particles like fine rain. It rises in vapour. Some is caught by what is on the surface of the earth, but the rest ascends in vapour form until it comes in contact with a much colder surface, to condense it into moisture. The vapour does not flow upwards in a uniform stream, but is mixed in the air by eddies and wind currents, and carried to bodies far from where it rose. In fact, dew may be deposited, even though the country for many miles all round be dry and incapable of yeilding any vapour. In such cases the supply of vapour to form that dew would depend on the evaporation of the dew, and on what was wafted over by the winds.

But the most practically convincing proof of the rising of dew from the ground is in the form of hoar frost or frozen dew. If it has been a bright, clear, sunny day in January, with no snow on the ground, look over the garden, grass, and walks on the morning after the intense cold of the night; big leaves may be found scattered over the place. You see little or no hoar frost on the upper surface of the leaves, but turn up the surface next the earth, or the road, or the grass, and what will you see? You have only to handle the leaf in this way to be highly astonished. A thick, white coating of hoar frost, as thick as a layer of snow, is on the under surface. Leaf after leaf will present the same appearance. If a number of leaves have been overlapping each other, then there will be no coating of hoar frost under the top leaves; but when you reach the lowest layer, next the bare ground, you will find the hoar frost on the under surface of the leaves. Now, that is positive proof that the hoar frost has not fallen from the air, but has risen from the earth. And hoar frost is, as we have said, frozen dew.

Dew, then, mostly rises from the ground, and what used to be thought dew is the active exudation of the healthy grass. These two facts are now established. Brilliant globules are produced by the vital action of the plant, showing life in one of the most charming forms in the phenomena of Nature. —*Wakefield Express.*

REVIEWS.

The Atmosphere in relation to Human Life and Health. By FRANCIS ALBERT ROLLO RUSSELL, V.P. Royal Meteorological Soc., Fellow San. Inst., &c. Smithsonian Institution, Washington, 1896. 8vo, pp. 148.

WHEN a paper has received Honourable Mention and a Silver Medal from the Hodgkins Fund, and has been accepted and printed by the Smithsonian Institution, an ordinary reviewer feels it rather presumptuous to add his little meed of praise, and decidedly dangerous even to hint that the author has not always said what the reviewer would have expected him to say.

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The first noteworthy features of this work are the large and extremely varied amount of information compressed into it, and the hopelessness of recovering any lost statement owing to there being neither index, nor table of contents, nor even specific headline on the pages. This might easily have been avoided, because the Memoir itself was written somewhat methodically in Parts and Sections. The Parts are—

I.—Constitution and Conditions of the Air ... page 2
II.—Climate Air and Health ... ... „ 51
III.—Various Atmospheric Conditions and Phenomena ... ... „ 87
IV.—Subjects for Research ... ... „ 117

Perhaps these do not sound very definite, but the Sectional headings, of which there must be more than a hundred, are so. We will give a few, just as we turn over the leaves :—Ozone, Vapour of water, Living germs in the air, Organic emanations from the skin, Influenza, Mode of attack of Miasmatic diseases, Mechanical ventilation in schools, The zodiacal light, Malaria.

There is a mass of information in the paper, of which it is not easy to convey an idea; perhaps the simplest plan is to reproduce two paragraphs :—

TYPHOID FEVER.

"Typhoid, or enteric, fever is most common in the autumn, and much less prevalent in May and June. There is a sharp decline in its prevalence in London in December. In New York, and in large towns in Europe, the maximum is decidedly apparent in late summer or autumn. The variation of prevalence according to season seems to show a distinct connection between the development of the bacillus and the temperature of soil and water; and, considering the long incubation and duration of cases, the maximum of infection must take place at the very time when the temperature of the soil, at 1 ft. or 2 ft. deep, is about at its highest."

HEIGHT OF THE ATMOSPHERE.

"Meteors which have been calculated to pass with ignition through air at a height sometimes as great as 300 miles; auroræ, of which the height has been estimated by careful observation sometimes to exceed 281 miles; and the duration of twilight, with polarizing effects of the sky, giving a height of 198 to 212 miles, agree in showing a much greater altitude for the extension of our atmosphere than was formerly supposed. First 5, and then 45, miles was generally stated as the outside limit. And we have to remember that at this great altitude of about 300 miles, the atmosphere is dense enough to produce very palpable effects. It would be a bold proposition to assign a limit to the atmosphere within 1,000 miles."

On the last pages of the Memoir, Mr. Rollo Russell develops, apparently in all seriousness, the most extraordinary meteorological proposal of which we ever heard—namely, the modification of climate

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by the erection of monster walls as wind barriers! That we may not be suspected of misrepresenting his views, we conclude by reprinting two sentences from page 147.

"Portsdown Hill, which runs east and west for nearly seven miles, and is over 400 ft. high, would be another highly favourable ridge for an experimental wall, say 400 ft. in height. The practicability of works of this kind can hardly be questioned when we hear of structures like the reservoir embankment at Bombay, a stone barrier 118 ft. thick, over 100 ft. high, and two miles long. A less amount of material would have gone toward a wind wall 30 ft. thick at the base, 300 ft. high, and three or four miles long.

"A wall 300 ft. or 400 ft. in height, and five or six miles in length, extending from near the Thames a few miles east of London, in a north-westerly direction, would probably have the effect of stopping a considerable amount of fog, which often moves from the Essex marshes toward the metropolis. It would somewhat increase the rainfall on its westerly side. A wall stretching from N.W. to S.E. across some of the heaths in the neighbourhood of Woking would reduce the rainfall of North-east Surrey and of London."

The Roman wall, and even the great wall of China, though of far greater length than any suggested by Mr. Rollo Russell, are trifles compared with the walls 300 ft. or 400 ft. high which the writer suggests. What landowners, and Parliament, would say to such proposals, has to be ascertained; and it might have facilitated discussion had the cost per mile, of a wall 400 ft. high and strong enough to resist any gale, been procured from some competent engineer There is another object which these gigantic walls might serve, they might assist the proposed communications with the inhabitants of Mars.

Effects of the Weather upon Vegetation. A Lecture given by JOHN CLAYTON to the Bradford Naturalists' Society, March 1st, 1897. Byles & Sons, Bradford, 1897. 8vo., with a photograph.

THIS is one of the most instructive and original lectures that we have seen for a long time. Mr. Clayton is evidently a keen, painstaking, and very original investigator; and instead of the lecture being a series of platitudes and quotations, as is generally the case, it is almost wholly the result of investigations carried out with great care and patience during many years. As is it published at a nominal price, we merely specify a few of the points treated—such as, the relation of tree girth to amount of foliage, relative growth of plants in sun and in shade, followed by considerations as to the sunshine recorded in different parts of England and its influence on crops, percolation gauges, why trees split in times of frost, and the relation between the elongation of twigs and their increase in girth. When a well-printed pamphlet gives information, almost wholly original, on all these points for sixpence,—we need not advise our botanical and agricultural readers what course to pursue.

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Observations made at the Blue Hill Meteorological Observatory, Massachusetts, U.S.A., under the direction of A. LAWRENCE ROTCH, A.M. *Discussion of the Cloud Observations*, by H. HELM CLAYTON. [Excerpt Annals of the Astron. Obs. of Harvard College.] Cambridge, U.S.A., 1896. 4to, 228 pp. and 18 plates.

THIS work is much more important and interesting than its title suggests, for it is not merely a Discussion of the Blue Hill Cloud Observations. Chapter I., entitled "Historical Sketch of Cloud Nomenclature," is really much more than a "sketch"; it occupies more than 50 4to pages, and gives the best history of the subject that we remember. It may be convenient to enumerate in chronological order the authorities quoted by Mr. Clayton:—

1801	Lamarck	1881	Möller	1888	Abercromby
1803	Howard	,,	Weilbach	1889	Maze
1804	Lamarck	1882	Vettin	,,	von Helmholtz
1815	Forster	,,	Klein	,,	Clayton
1828	Clos	1883	Koppen	1890	Hildebrandsson, Köppen, Neumayer
1831	Kaemtz	,,	Russell, Rollo	,,	van Bebber
1841	Loomis	,,	Ley	1891	Abbe, C.
1846	Fritsch	,,	Mohn	,,	Singer
1857	Jevons	1884	Tissandier	,,	Vincent
1860	Schmid	1885	Scott	1892	Kassner
1861	Herschel	,,	Sprung	,,	Möller
1863	Fitzroy	1885	Ley, Hildebrandsson, Capello	1893	Gaster
,,	Poëy	,,	Barker, Wilson	,,	Hildebrandsson
1865	,,	,,	Möller	,,	von Bezold
1868	Loomis	1886	Jesse	1894	Ley
1870	Poëy	,,	Toynbee	,,	Davis, W. M.
1874	Muhry	1887	Abercromby	,,	Hildebrandsson, Riggenbach, TeisserencdeBort
1875	Blasius	,,	Clayton		
1879	Ley	,,	Hildebrandsson, Abercromby		
,,	Poëy				
1880	Ley				
,,	Hildebrandsson				

Although the above list is not—does not profess to be—complete, it sufficiently indicates the thought and care devoted to the preparation of the "sketch"—a sketch of great ability and usefulness. We are not prepared to controvert any of the writer's statements, but at the same time we regret that he has been led to prepare, for use at Blue Hill, so complex a nomenclature (29 varieties) as that given on p. 342.

It is impossible for us to deal exhaustively with this work. Cloud observations as to amount, form, motion and altitude, have long been a feature in Blue Hill work; and in this paper we have a masterly discussion of them in relation to cyclones and anticyclones, to wind motion, to rainfall, to temperature, and to weather forecasting. We have long had doubts respecting the ideal forms of cyclones, and the following paragraph from p. 449 supports our doubts.

> "Another point of interest shown by the preceding results is, that a cyclone cannot be looked upon as an eddy in the atmos-

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phere like an eddy in a river, because the highest air currents have a resultant velocity of drift thirty times as fast as the lowest current, and the eddy would be rapidly destroyed. The cyclonic circulation must rather be considered as continuously renewing itself, and struggling against velocities of drift which vary with the altitude."

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, April 21st, at the Institution of Civil Engineers, Great George Street, Westminster, Mr. E. Mawley, F.R.H.S., President, in the chair. The following papers were read:—

Mr. W. H. Dines on "*The relation between cold periods and anti-cyclonic conditions of weather in England during the winter.*" There seems to be a generally accepted belief that anti-cyclonic conditions during the winter are likely to be accompanied by exceptional cold, but (for England) the author's observation has led him to the opposite conclusion, and he always expects a frost to break up as soon as the barometer gets much above 30·00 inches. To test the truth of this theory, he tabulated the height of the barometer during all the cold periods during the three winter months of the fifty years 1841-90. Out of 74 frosts, he found that 16 only had a pressure exceeding 30·20 inches, and the majority of these were of very short duration. Thirty-three, or less than half, had a pressure exceeding 30·00 inches. Twenty-one had a pressure below 29·80 inches, and these included almost every frost in the period remarkable for its length or severity.

Mr. A. Lawrence Rotch on "*The use of kites to obtain meteorological records in the upper air, at the Blue Hill Observatory, Mass.*" Three kinds of kites have been used, viz.: 1, the Malay kite, which presents a convex surface to the wind; 2, the Hargrave cellular kite; and 3, a flat kite, with a fin or keel on the front, devised by Mr. Clayton. These kites are attached to a wire carrying self-recording meteorological instruments, and a steam winch automatically distributes the wire on the drum and records its pull. The instruments have been elevated more than one hundred times, and valuable meteorological data as to the changes of temperature, humidity, and wind, up to an extreme altitude of 8,740 feet above Blue Hill have been obtained.

The meteorographs recently employed are an anemo-thermograph, made by Fergusson of the Observatory, and a baro-thermo-hygrograph made by Richard of Paris. These instruments are constructed chiefly of aluminium, and each weighs less than 3 lbs. One of them is hung to the end of a steel pianoforte wire, having a tensile strength of 280 lbs., between two or more kites which are attached

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to the wire by independent cords. According to the strength of the wind, other kites can be attached at intervals by a peculiar form of clamp, and serve to lift the wire.

The altitude may be determined by triangulation from two stations at the ends of a base-line, but more easily by one angular measurement at the winch, the length of kite line being known. When the Richard meteorograph is hidden by clouds, differential measures of altitude are obtained from its barometric records. Measurements of the height and thickness of the lower clouds are frequently made by this method.

Kites are greatly superior to captive balloons for meteorological observations, except during calms or very light winds, which, however, seldom extend aloft. Not only do kites cost very much less, but they can lift a light load, such as a meteorograph, much higher in ordinary winds. The Blue Hill Kites fly in all weathers, whenever the wind blows between twelve and fifty miles an hour, whereas captive balloons are driven down by strong winds along an arc whose radius is the lifted cable, and thus transmit violent shocks to the suspended instruments.

Mr. A. B. MacDowall on "*Suggestions of Sunspot influence on the weather of Western Europe.*" The author believes that there is a tendency to greater heat in the summer half-year, and to greater cold in the winter half-year near the phases of minimum sunspots than near the phases of maximum; the contrast between the cold and heat of the year being intensified about the time of minimum sunspots.

THE ICY SAINTS.

We think that it would be good if some investigator would study the subject of low temperatures in May. In France, May 11th to 14th, the fête days of St. Mamertius, St. Pancras, St. Servais and St. Pacôme, are known as the "jours de glace," and the proverb is given in another form in Inward's *Weather Lore*:

"Who shears his sheep before St. Servatius's day loves more his wool than his sheep."

The daily mean temperatures now adopted at Greenwich show a cooling of only about half a degree for the four days, but means do not tell us everything, and it is possible that the cold spell may vary in date, or in intensity. In our number for June, 1891, we reproduced a lovely frost scene of May 18th, and it will be remembered that on May 22nd, 1867, the Derby was run in a snowstorm. We do not suggest that either the 18th or the 22nd has much to do with the 11th–14th—but merely that the whole question is worth study. In 1895 the 11th–14th were hot, but the mean temperature at Greenwich fell to 42°·9 on 17th, and in 1897 the mean temperature in London on the 12th was 42°·6, and for the 11th–13th averaged 43°·6, or 8°·4 below the mean.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, NOVEMBER, 1896.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	50·3	12	25·4	30	46·0	34·9	36·1	85	80·1	19·1	1·17	10	6·2
Malta	83·0	1	49·4	23	69·2	58·8	55·2	79	124·7	44·4	5·12	14	7·1
Mauritius	83·4	13	65·0	11	81·1	68·9	63·1	70	136·1	55·5	·91	9	5·5
Calcutta	89·7	2	58·0	28	83·6	64·4	62·8	68	147·2	49·6	·05	...	2·1
Bombay	92·8	12	66·2	24	88·2	75·4	70·6	69	139·5	58·3	·53	3	2·8
Ceylon, Colombo	91·0	5	72·2	23	87·4	75·0	73·3	82	152·0	68·3	19·81	27	6·0
Melbourne	97·4	23	36·5	2	74·5	51·4	48·9	67	145·5	24·6	·71	6	5·1
Adelaide	103·4	25	46·5	2	84·2	58·1	47·5	44	162·1	33·5	·52	3	4·4
Sydney	88·0	13	48·6	1	71·7	59·3	58·6	75	147·2	43·8	5·23	22	6·5
Wellington	69·0	25	39·0	2	62·2	48·4	45·4	70	139·0	30·0	2·82	12	4·3
Auckland	72·0	29	46·5	2	64·9	52·1	52·3	82	138·0	43·0	1·63	17	5·3
Jamaica, Kingston	92·3	10	69·4	15	88·9	71·6	68·9	71	...	...	1·40	9	...
Trinidad	91·0	3, 19	69·0	13	88·3	71·2	74·1	86	177·0	68·0	9·81	22	...
Grenada	88·0	4	67·2	30	83·1	73·4	74·4	77	155·2	...	20·90	26	5·0
Toronto	63·8	18	17·5	30	47·2	31·9	34·8	78	73·0	12·5	2·95	20	7·6
New Brunswick, Fredericton	60·9	6	— 1·1	23	39·3	22·1	26·8	73	...	...	4·98	16	7·0
Manitoba, Winnipeg	36·5	2	—31·7	30	15·6	—1·7	...	...	...	...	1·31	19	6·5
British Columbia, Esquimalt	56·7	13	16·7	27	40·9	33·6	35·4	90	...	...	10·97	19	7·1

REMARKS.

MALTA.—Adopted mean temp. 62°·7, or 0°·6 above the average. Mean hourly velocity of wind 10·8 miles. Average temp. of sea 69°·8. Lightning on 10 days; thunderstorms on 3 days; hail on 2 days. The shade max., 83°·0, is the highest recorded for November. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·3, dew point 1°·0, and rainfall ·98in. below, their respective averages. Mean hourly velocity of wind 11·0 miles, or 0·1 above average; extremes, 25·0 on 4th and 2·3 on 3rd; prevailing direction, S.E. by E. to E. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 11 days. A. E. WACKRILL.

Adelaide.—A warm, dry month, the temp. being 4°·3 above, and the rainfall ·48 in. below, the average. C. TODD, F.R.S.

Sydney.—Rainfall 2·02 in. above, temp. 1°·1 below, and humidity 5°·4 above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Showery in the early part of the month, with fine intervals; wind chiefly S.; the latter part very fine, with moderate and variable winds. Slight thunder on 1st and 11th. Snow on near hills on 1st and 2nd. Hail on 1st and 2nd. Slight earthquake on 27th, at 3 p.m. Mean temp. 1°·2 below, and rainfall 1·35 in. below, their respective averages. R. B. GORE.

Auckland.—A dry month, with an unusual predominance of cold S.W. winds. Rainfall barely half the average of 29 years. Mean temp. 2° below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 2·7 miles. Rainfall about half the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 2·95 in. above the 30 years' average. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, APRIL, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	1·59	XI.	Rhayader, Nantgwillt ...	5·97
II.	Dorking, Abinger Hall .	1·62	,,	Lake Vyrnwy	5·13
,,	Birchington, Thor	1·78	,,	Corwen, Rhug	2·42
,,	Hailsham	1·87	,,	Criccieth, Talarvor	3·15
,,	Ryde, Thornbrough	2·62	,,	I. of Man, Douglas	2·97
,,	Emsworth, Redlands ...	2·26	XII.	Stoneykirk, Ardwell Ho.	2·37
,,	Alton, Ashdell	1·77	,,	New Galloway, Glenlee	2·75
III.	Oxford, Magdalen Col..	2·39	,,	Lilliesleaf, Riddell	1·47
,,	Banbury, Bloxham	1·42	XIII.	N. Esk Res. [Penicuick]	2·20
,,	Northampton, Sedgebrook	1·90	,,	Edinburgh, Blacket Pl..	1·04
,,	Duddington [Stamford].	1·66	XIV.	Glasgow, Queen's Park..	2·01
,,	Alconbury	1·49	XV.	Inverary, Newtown	3·97
,,	Wisbech, Bank House...	1·56	,,	Oban, The Corran	3·14
IV.	Southend	1·42	,,	Islay, Gruinart School ...	1·27
,,	Harlow, Sheering..... ...	1·79	XVI.	Dollar.....	1·51
,,	Colchester, Lexden	1·66	,,	Balquhidder, Stronvar...	5·47
,,	Rendlesham Hall	1·49	,,	Ballinluig	2·59
,,	Rushall Vicarage	2·02	,,	Dalnaspidal H.R.S.....	3·92
,,	Swaffham	2·42	XVII.	Keith H.R.S.....	·77
V.	Salisbury, Alderbury ...	2·24	,,	Forres H.R.S.	·70
,,	Bishop's Cannings	2·25	XVIII.	Fearn, Lower Pitkerrie..	·82
,,	Blandford, Whatcombe .	3·79	,,	N. Uist, Loch Maddy ...	3·91
,,	Ashburton, Holne Vic...	6·01	,,	Invergarry	3·31
,,	Okehampton, Oaklands.	5·05	,,	Aviemore H.R.S.	1·44
,,	Hartland Abbey	3·77	,,	Loch Ness, Drumnadrochit	1·83
,,	Lynmouth, Glenthorne.	4·54	XIX.	Invershin	·63
,,	Probus, Lamellyn	5·03	,,	Scourie	1·94
,,	Wellington, The Avenue	2·79	,,	Watten H.R.S.....	·92
,,	Wincanton.....	3·30	XX.	Dunmanway, Coolkelure	8·55
VI.	Clifton, Pembroke Road	3·68	,,	Cork, Wellesley Terrace	6·00
,,	Ross, The Graig	2·13	,,	Killarney, Woodlawn ...	4·01
,,	Wem, Clive Vicarage ...	1·68	,,	Caher, Duneske	4·17
,,	Cheadle, The Heath Ho.	3·27	,,	Ballingarry, Hazelfort...	4·04
,,	Worcester, Diglis Lock	1·12	,,	Limerick, Kilcornan ...	5·21
,,	Coventry, Kingswood ...	2·18	,,	Broadford, Hurdlestown	3·85
VII.	Grantham, Stainby	1·71	,,	Miltown Malbay	6·85
,,	Horncastle, Bucknall ...	1·28	XXI.	Gorey, Courtown House	4·19
,,	Worksop, Hodsck Priory	1·31	,,	Athlone, Twyford	4·54
,,	Neston, Hinderton	2·03	,,	Mullingar, Belvedere ...	4·36
VIII.	Southport, Hesketh Park	2·73	,,	Longford, Currygrane...	4·26
,,	Broughton-in-Furness ...	3·73	XXII.	Woodlawn	4·39
IX.	Ripon, Mickley.....	1·61	,,	Crossmolina, Enniscoe ..	4·90
,,	Melmerby, Baldersby ...	1·35	,,	Collooney, Markree Obs.	3·40
,,	Scarborough, Observat'y	1·78	,,	Ballinamore, Lawderdale	...
,,	Middleton, Mickleton ...	1·73	XXIII.	Lough Sheelin, Arley...	...
X.	Haltwhistle, Unthank...	1·85	,,	Warrenpoint.....	3·64
,,	Bamburgh	1·14	,,	Seaforde.....	2·57
,,	Keswick, The Bank.....	2·82	,,	Belfast, Springfield	2·77
XI.	Llanfrechfa Grange	4·65	,,	Bushmills, Dundarave..	2·38
,,	Llandovery	3·75	,,	Stewartstown	2·86
,,	Castle Malgwyn	3·23	,,	Killybegs	4·22
,,	Builth, Abergwesyn Vic.	6·01	,,	Lough Swilly, Carrablagh	2·80

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APRIL, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·57	— ·17	·23	6	16	67·3	27	27·8	11	2	9
II.		Maidstone (Hunton Court)...	2·04	+ ·39	·80	28	10	...	...	...	...	...	...
,,		Strathfieldsaye	1·53	...	·44	15	16	...	...	...	...	...	...
III.		Hitchin	1·77	— ·02	·43	28	13	66·0	26*c*	26·0	10	5	...
,,		Winslow (Addington)	1·57	— ·35	·31	16	14	68·0	28	26·0	11	3	7
IV.		Bury St. Edmunds (Westley)	2·07	+ ·41	·45	16	15	64·0	29	30·0	6	...	...
,,		Norwich (Brundall)	1·81	...	·29	16*a*	17	67·8	27	27·0	9	6	12
V.		Weymouth(LangtonHerring)	2·92	+ 1·04	·49	11	16	64·0	28	32·0	5	1	...
,,		Torquay (Cary Green)	3·98	...	1·26	26	20	59·9	28	34·3	2	0	2
,,		Polapit Tamar [Launceston]..	3·32	+ 1·10	·44	16	24	65·8	27	29·4	11	1	4
VI.		Stroud (Upfield)	1·81	— ·34	·26	12	20	68·0	28	31·0	4	1	...
,,		ChurchStretton(Woolstaston)	2·21	— ·13	·37	16*b*	20	63·5	27	27·0	5	7	13
,,		Tenbury (Orleton)	...	...	...	...	...	...	...	...	...	...	...
VII.		Leicester (Barkby)	1·67	— ·43	·38	17	17	67·0	29	21·0	4	6	16
,,		Boston	1·29	— ·42	·31	16	15	69·0	29	27·0	11	5	...
,,		Hesley Hall [Tickhill].....	1·59	— ·12	·42	28	15	67·0	29	27·0	5, 11	8	...
VIII.		Manchester(PlymouthGrove)	2·16	+ ·45	·50	16	17	64·0	26	27·0	4	4	4
IX.		Wetherby (Ribston Hall) ...	...	...	...	...	...	...	...	...	...	...	...
,,		Skipton (Arncliffe)	4·11	+ ·68	·82	17	16	..	...	...	...	...	...
,,		Hull (Pearson Park).	1·75	— ·17	·36	16	17	67·0	29	27·0	3, 11	11	11
X.		Newcastle (Town Moor)	1·69	— ·14	·44	17	12	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	7·27	+ ·13	1·80	13	14	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	4·30	+ 1·89	·56	17	22	...	...	...	...	...	...
,,		Haverfordwest	4·08	+ 1·45	·71	5	23	62·9	28	30·2	11	1	8
,,		Aberystwith (Gogerddan) ...	4·04	+ 1·48	·73	6	17	64·0	26	21·0	1, 7	8	...
,,		Llandudno.....	3·11	+ 1·30	·55	13	18	59·5	28	33·5	8	0	...
XII.	SCOTLAND.	Cargen [Dumfries]	3·46	+ 1·23	·92	13	12	60·8	26*a*	24·6	1	9	...
XIII.		Edinburgh (Blacket Place)...	1·04	...	·33	13	13	57·3	29	26·4	3	6	14
XIV.		Colmonell	3·12	...	·87	13	14	63·0	27	24·0	1	...	...
XV.		Lochgilphead (Kilmory).....	3·48	+ ·67	·79	13	13	...	...	21·0	1	10	...
,,		Mull (Quinish).....	3·74	+ ·76	·88	13	13	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·60	— ·62	·70	14	7	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1·50	— ·55	·55	13	15	59·0	28	27·7	2	8	...
XVII.		Braemar	2·51	+ ·09	1·17	13	14	53·2	22	13·4	3	15	27
,,		Aberdeen (Cranford)	2·51	...	·84	13	17	57·0	29	23·0	2	5	...
,,		Cawdor (Budgate)	·79	— ·73	·20	15	12	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	2·92	+ ·11	·73	16	9	...	...	...	...	...	...
,,		Glencarron Lodge.....	4·14	...	·78	13	15	57·7	27	23·0	2	12	...
XIX.		Dunrobin	·68	— 1·05	·23	12	8	53·0	28	27·8	3	4	...
,,		S. Ronaldsay (Roeberry).....	1·42	— ·19	·56	13	17	54·0	17	27·0	1, 2	4	...
XX.	IRELAND.	Darrynane Abbey.....	5·69	...	·80	12	23	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	5·05	+ 2·58	·86	12	23	61·0	28	31·0	2	1	...
,,		O'Briensbridge (Ross)	5·19	...	·54	3	20	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	3·63	+ 1·35	·47	5	22	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	2·49	+ ·37	·42	20	22	59·7	28	29·9	2	1	4
XXII.		Ballinasloe	4·78	+ 2·44	·58	16	23	58·0	26	30·0	1, 2	5	...
,,		Clifden (Kylemore)	7·38	...	1·14	5	19	...	...	...	...	...	...
XXIII		Waringstown	3·24	+ ·82	·75	15	19	63·0	29	26·0	2	7	15
,,		Londonderry (Creggan Res.).	2·24	·00	·33	29	20	...	...	...	...	...	...
,,		Omagh (Edenfel)	2·92	+ ·69	·40	20	19	60·0	26	26·0	1	6	16

+Shows that the fall was above the average; —that it was below it.

a—and 28. *b*—and 17. *c*—and 27.

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METEOROLOGICAL NOTES ON APRIL, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; T S for Thunderstorm: R for Rain; H for Hail; S for Snow.

ENGLAND.

ADDINGTON.—Cold, ungenial weather until the 26th, when there was a considerable rise in the max. temp. On the afternoon of the 16th a sharp TS occurred, and another on the evening of the 28th. Mean temp. just one degree higher than the mean of March. The cuckoo rather early, heard on the 15th. Swallows seen on same date. Nightingale later, not heard until 24th. S on 1st and 7th. H on 30th.

BURY ST. EDMUNDS, WESTLEY.—The month was cold, with the exception of the 13th till the 26th, then warm till the end. A violent TS occurred on the 28th, with unusual darkness about midday, very heavy in Mid-Suffolk. The migratory birds came at their usual times. Distant T on 7th and 17th.

NORWICH, BRUNDALL.—Rainfall ·14 in. above the average; mean temp. slightly below. Prevailing winds from N.E., S.E., and S.W. The early part of the month was very ungenial, with S on 1st, 2nd and 5th. Windy weather and cool for the season till the fourth week, when some warm days alternating with heavy rains forced on vegetation.

WEYMOUTH, LANGTON HERRING.—Rainfall for the first four months of the year, 58 per cent. above the average. Average temp. at 9 a.m., 47°·1, or 0°·4 below the average of 25 years. Solar halos on 11th and 20th. Fogs on 9th, 27th and 28th. TS on 26th.

TORQUAY, CARY GREEN.—Rainfall 1·64 in. above the average. Total rainfall of the first four months 4·81 in. above the average. Mean temp. 47°·5, or 0°·7 below the average. Duration of sunshine 139 hours 35 minutes, being 43 hours 55 minutes below the average. Total sunshine of the first four months 86 hours 40 minutes below the average. The R of the 26th, 1·26 in., all fell in five hours, between 5 p.m. and 10 p.m.

POLAPIT TAMAR [LAUNCESTON].—Unusually wet for April, also a cold month generally. For the fortnight from the 11th to the 24th strong winds to half gales were prevalent. H storms on 6th and 7th. Distant L on 26th.

STROUD, UPFIELD.—Sleet on 1st. Gales from S.E. on 3rd, and from S.W. on 14th and 17th. T on 28th.

WOOLSTASTON.—A backward month. The first week very cold, with S storms on 1st and 6th. First swallow on 11th; cuckoo on 21st. T and L on 28th. Mean temp. 44°·1.

LEICESTER, BARKBY.—A rather cloudy and windy month. Mean temp. 45°·4. T on 16th and 28th. S on 6th and 7th. Cuckoo heard on 13th; swallow seen on 17th.

HULL, PEARSON PARK.—H on 2nd and 4th. TS at noon on 16th.

WALES.

HAVERFORDWEST.—The first four months of this year have produced 16·74 in. of rain, the general characteristics being constant wet and mildness. In 1867 the rainfall for the first four months was 26·55 in., character constant wet and severity, S forming a large portion of the fall. In 1872 constant R and mildness characterized the first four months, the fall being 23·34 in. So during the last 48 years there have been two notably wetter springs than the present. April this year has been remarkable for constant R, but never any very heavy fall.

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S on the 1st. Lunar halos on 10th and 15th. Aurora on 11th. Vegetation very forward; ash and oak both out, ash the earlier. Prevailing winds from S.E. 19 days, S.W. 9 days.

ABERYSTWITH, GOGERDDAN.—A cold and stormy month, with very little sunshine.

SCOTLAND.

CARGEN [DUMFRIES].—A cold, rainy, sunless month, resembling in almost every particular the exceptionally unpleasant April of 1877. The mean Bar. pressure has only been less in six, the mean temp. lower in five, the rainfall greater in six, and the sunshine less in two, out of the 38 years over which observations extend. The mean temp. is only 1°·7 higher than that of February, while the mean min., 34°·7, is actually lower than that of either February or March. Easterly winds prevailed on 21 days. Heavy S showers occurred on 15th. The total R for the first four months of the year, 14·24 in., is only ·71 in. above the average for that period. Vegetation is unusually backward, fully three weeks later than last year.

COLMONELL.—Rainfall ·81 in. above, and mean temp. 0°·4 below the average of 21 years. Heavy S shower on 1st; S on 14th; T on 14th and 15th.

MULL, QUINISH.—The week from 11th to 18th was exceptionally wet and stormy. Tremendous H showers, with T and L, from S.W. on 14th, 15th and 16th.

BRAEMAR.—A very cold and backward month.

ABERDEEN, CRANFORD.—This month has been cold, with little sunshine.

S. RONALDSAY, ROEBERRY.—A very cold month. Mean temp. 41°·6, being 2°·6 below the average of seven years.

IRELAND.

DARRYNANE ABBEY.—Another very wet month, and cold, except the last few days.

WATERFORD, BROOK LODGE.—Showers of S on 1st; heavy H showers on 6th; H and S on 14th. Swallows seen on 24th; cuckoo heard on 26th.

O'BRIENSBRIDGE, ROSS.—The wettest April for 30 years, but exceeded in 1867, when 6·43 in. of R fell. Temp. very low during the month, and gales frequent and heavy. Everything late.

DUBLIN.—A cold, changeable, rainy month. The amount of cloud was 12 per cent. in excess of that of April, 1896. Mean temp. 45°·9, or 1°·8 below the average. Fog on 21st. High winds on 16 days, reaching the force of a gale on 3rd and 10th. H fell on five days. Solar halos were seen on the 8th and 16th. Lunar halos on the 10th and 15th. S or sleet fell on the 1st and 14th.

WARINGSTOWN.—A very backward season.

OMAGH, EDENFEL.—Until the 21st the weather of April was a continuance of the extremely wet and unsettled weather of March, with the addition of a decreased instead of an increased mean temp.; as a result, vegetation, even of trees, absolutely stood still, as might also be said of all kinds of farm labour. The fourth week, however, was fine and generally dry and clear, and much agricultural work was overtaken; but the month ended in a return to the rainy and unsettled condition prevailing now for so many months.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXVII.] JUNE, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

HAILSTORM AT SEAFORD, SUSSEX, MAY 30TH, 1897.

IT is very rare for it to be possible to prove that in England, over a considerable area, a shower of hailstones has fallen each of which was as large as a hen's egg. This we are in a position to do, thanks to the following correspondence, and to two different photographs with which also we have been favoured. We intend to give (1) letters received from observers personally known to us; (2) verbatim reprints from local and other newspapers; (3) condensed notes from various sources; (4) a brief commentary on the whole.

To the Editor of the Meteorological Magazine.

SIR,—As I have not seen in a London or other paper any notice of a curious storm here, last Sunday, May the 30th, I send you some remarks in case you care to note them.

It had been an exceedingly hot day, with scarcely a breath of wind on the high cliffs towards Beachy Head, and during the afternoon light clouds covered the sky. At about 6.30 p.m. a dark cloud, with two long streamers apparently issuing from the sea, approached from the south, and on nearing the shore the calm surface of the water was suddenly covered with heavy splashes, as if a vast shower of big stones had been thrown in. Half a minute later hailstones fell on the land, varying in size from that of a small marble to four or even five inches round. The large stones all had a round nucleus of opaque white frozen snow, about half-an-inch in diameter, and this was surrounded by a ball of transparent ice. As these ice-balls of the largest size fell on an average ten feet apart, they did not do so much damage as would have taken place had they been closer together, but they broke every pane of glass exposed horizontally to their force. After the hail had fallen for two or three minutes, another five minutes of very heavy rain followed, and when I ran out, on this ceasing, to pick up two big hailstones which I saw on the road, I found on measuring them that they were 4½ inches round. As these had been exposed fully seven minutes on the ground, and for five out of the seven to rain, I conclude that they were

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originally somewhat larger. When the storm was over, very many persons came out and collected the large hailstones in bags; I wondered why.

In 1846 a similar storm occurred at Herne Hill, where my father lived, and in a very few minutes glass in his conservatories to the value of nearly £400 was destroyed, but I do not remember any other.

The glass used now is much stronger than it was in 1846, and in greenhouses especially; I noticed that last week the window-panes escaped very generally, whereas I am sure they would have been broken had the old glass been there.

It appears that the hail was most local, for it did not fall two miles off East or West.—Most sincerely yours,

A. S. BICKNELL.

5, Esplanade, Seaford, Sussex.

SIR,—The weather on 30th, though very warm, was lovely in the morning and afternoon; but towards 5 p m. clouds began to draw up from the S.W., and about 6 p.m. there was distant T, which came closer. I counted 14 slowly between the L and the T. The remarkable feature was the large H; a quarter of an hour after the stones had fallen I saw three each measuring $1\frac{3}{4}$ in. by $1\frac{1}{8}$ in., slightly flattened and with a nodulated surface. A friend picked up several $4\frac{1}{4}$ in. in circumference. Several of the large ones left in a hot kitchen for four hours were found to have melted only to the size of small marbles; must not the ice have been exceptionally cold? Twigs and branches were cut off as with a knife, and much glass was broken.—Yours truly,

York House, Seaford, May 31st. A. ALDAM MOON.

SIR,—Reports having reached me respecting the severe hailstorm which swept across this county on Sunday evening, May 30th, I am induced to send you the following account, furnished to me by the Rev. Chancellor Parish, of what occurred at his Vicarage of Selmeston, near Polegate.

> "I am anxious to describe, as well as I can, the hailstorm which fell upon us yesterday (May 30th), as I am sure you must have watched it from a distance with great interest. The storm clouds drew up from the S.W., and I remarked them about 2.30, but they advanced slowly till they appeared all around us; at about 6 p.m., I came indoors and made my notes of the services of the day, &c., I then observed that it became vary dark, and suddenly, between 15 and 20 minutes past six, a terrific storm of wind and rain swept down upon us. I walked to the window of my study to look at it, and the rain changed to hail, and the stones became larger and larger till their size was quite alarming. The whole duration of the storm was, as near as I could guess (without having timed it),

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six minutes or seven—viz., two minutes rain; one minute ordinary hail the size of a pea (diameter 0·1 in. to 0·2 in.); two minutes larger stones, the size of small marbles (diameter 0·4 in. to 0·5 in.); two minutes largest size of irregularly oval shape, (about 1½ inches by ¾ inch). My drawing-room window and door were wide open, and the storm swept right through. Twenty-five panes of glass were completely smashed, and the shattered fragments were scattered all over the room. The floor was covered with hailstones. The noise was tremendous, and almost silenced the sound of the thunder, which was incessant. As the storm approached, some swallows made immense and successful efforts to get *above it*. They went almost straight up in the air, and when the storm suddenly ceased, there they were—high and dry. I should like to have seen it from their point of view. One feature was the surprising way that the stones bounded straight up off the lawn, more than two feet, I judge by the height of my railings. The rainfall here was only ·31 in. as measured at 9 a.m., 31st."

At Sherrington Manor, a short distance from Selmeston, sad havoc was made upon the conservatories and hot-houses, not only the glass being broken, but the valuable plants very much injured.

From Crowborough I watched the progress of the clouds for some hours. Very heavy electric clouds appeared over the South Downs, near Newhaven, soon after 3 p.m., and for some time remained almost stationary. A rather strong easterly wind was blowing over Crowborough Hill at the time, which seemed to prevent the storm advancing in our direction; this wind at last increased in force, and apparently drove back the advancing clouds upon the main mass of the storm. Soon after six p.m., a line of nimbus cloud, two or three miles in length, of a whitish appearance, exhibited a well-defined edge on the northern side, and any further advance of the storm in our direction was checked. After passing over Seaford and Selmeston, it rapidly increased its pace, and finally disappeared to the eastward.

A rain storm, which passed over Crowborough from 6.55 to 6.59 p.m., came from quite another direction, viz., from the N.W. It came on quite suddenly with a vivid flash of lightning and unusually loud thunder. The rain fell in torrents for four minutes, when it ceased as suddenly as it had commenced. The rainfall was just ·30 of an inch in the time. No hail fell here.

I enclose some newspaper cuttings respecting this storm, and also a photograph of a group of hailstones which fell at Seaford, in fac-simile size. Such large hailstones have not fallen in Sussex since Aug. 23rd, 1855, when they were ordinarily the size of pullets' eggs, and some much larger, measuring from three to six inches in circumference.

Yours truly,

C. LEESON PRINCE, F.R.Met.S.

The Observatory, Crowborough Hill, June 5th, 1897.

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REMARKABLE HAILSTONES.

To the Editor of the "Morning Post."

SIR,—It would be interesting to know whether other places experienced the wonderful storm which visited us last Sunday, May 30th. At about 6.30 p.m. there fell for the space of some minutes a shower of hailstones varying in size from a hen's to a pigeon's egg, some of which weighed three-quarters of a pound each,* and measured over 5 in. in circumference. They had the appearance of balls of ice, with a coarsely granulated surface, and the centre of each was rayed like a crystalline star. The sight was a memorable one, and the damage done to the glass in the town and neighbourhood was very considerable.—Yours, &c., E. DEVERSON.

Seaford, Sussex, June 5th.

A SHOWER OF ICE.

ON Sunday evening, Seaford and the immediate district to the westward, were subjected to a sort of bombardment by a furious shower of ice, large frozen lumps and fragments crashing down with tremendous force, for a brief space of time. A hailstorm in summer is an unusual event, but a storm, whose hail consists, as it did on Sunday, of pieces of ice, most of which were considerably more than an ounce in weight, is a marvellous occurrence—at least in this country. In the tropics, according to travellers' tales, such a hail would not be regarded with surprise. Many of the hailstones which fell on Sunday were globular in shape, and were as large as a golf ball, though a few were equal in size to a small orange. Several of these, on being examined, were seen to have cores from which radial lines extended. Others were as large as a hen's egg, while some were angular in shape. Hailstones which were compared to cocoa-nuts for magnitude, were reported to have fallen, but their apparent size seems to have been due to the spectacles through which they were viewed. Ten "stones," picked up without making any selection as to bulk, weighed a pound, *and one was found which turned the scale at four ounces.* Others were put into the scale with the object of ascertaining the quantity of fluid resulting from liquefaction, and one was said to have filled, when melted, a "three measure of Scotch," whatever that may be, but a small wine glass, which the water from another filled, is a vessel whose capacity will be more generally understood. The shower of ice lasted only a few minutes, but it is scarcely necessary to state that it practically wrecked every greenhouse in the district. Much damage was also done to glass in a perpendicular position, and many

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* This is a mistake, or misstatement. The *dimensions* given by the writer agree with those of other persons, and with the photographs, but the *weight* is at least three times too great. "Three-quarters of a pound" of ice is about 22 cubic inches; but the largest hen's egg may be taken as 4 cubic inches, and if so, then the "¾ lb." is about five times too great. Probably the writer meant 3 oz., which would be very probable.—ED. *M.M.*

P.S.—We are glad, at the very moment of sending this for press, to be able to clear up the puzzle. We communicated with the writer, and find that *three* weighed ¾ lb., so that they averaged 4 oz. each; and she adds that several which she "handled were certainly much larger than hen's eggs"; this agrees very well with the "4 oz." She "heard of" five turning the scale at 1½ lbs., *i.e.*, 4·8 oz. each, but did not see it. Our correspondent mentions also the extreme density of the ice to which attention is drawn on p. 66.—ED. *M.M.*

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windows in the houses along Claremont Road, and on the Queen's Park, were broken. At the Buckle—the unfortunate Buckle—the windows were riddled, and nearly every pane of glass in the Buckle Inn was smashed. Much poultry was killed.

The phenomenon, for only as such can it be described, occurred about a quarter to seven p.m. The afternoon had been very hot and sultry, and a dense bank of black clouds had become massed in the south-west. About six o'clock the reverberations of a distant thunderstorm were heard; the storm gradually approached, and then a funnel-shaped cloud—apparently a water-spout—was seen to detach itself from the black mass in the south-west; it crossed the bay in a northerly direction with terrific rapidity, and heralded by a violent eddying wind, and accompanied by blinding flashes of lightning, it swept over the land, its track being marked with rolling volumes as of smoke, while there descended a tremendous shower of ice, the clatter of which was almost awe-inspiring by its strangeness. The full force of the storm, however, seems to have been felt along the Bishopstone Valley, and *even on Monday, Norton Top, with its covering of ice, glittered in the sunlight like an Alpine peak.* Chyngton and Sutton, on the other hand, were just on the edge of the path of the storm. The oldest inhabitants, some of whom have very prodigious memories, have no recollection of such a phenomenon in the past, and doubtless an account of the shower of ice on Sunday will be handed down to posterity as an interesting item in the annals of local history. Mr. W. R. Wynter, of Seaford, has on sale some exceedingly fine photographs of groups of the hailstones, which he has taken.

SEAFORD.

A HAILSTORM of unusual violence was experienced at Seaford on Sunday evening—such a storm, in fact, as one hears of as occurring in other lands, but which one scarcely believes, and, unless seen, can hardly realise. The day had been beautifully fine, calm, and warm, but towards six o'clock a bank of clouds was seen to be moving up from the sea, and after a short time the appearance of these clouds was most peculiar. Suddenly there was a great gust of wind, and for two or three minutes great blocks of ice fell. Some of these exceeded six inches in circumference, while they weighed as much as two ounces each. They were of varied shape, some being round, others being long, but all were of immense size. The services at the various places of worship had just commenced, and the sound of the large blocks of ice falling on the roof reverberated through the buildings, so that the proceedings could scarcely be heard, while many of the congregation were considerably alarmed. Much damage was done to windows in the district, while the greenhouses suffered to a great extent, many of them having 50 and 100, or even more, panes broken. Such a storm has not been experienced by the oldest inhabitant.—*Brighton Observer*, June 4th.

RIPE.

TERRIFIC HAILSTORM.—On Sunday evening a hailstorm of remarkable violence broke over the district of Ripe and Berwick, the hailstones being of exceptional size, some of them being almost round and measuring as much as two inches in diameter. Much damage was done to greenhouses and other glass

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structures in the gardens, and many young ducks and geese were killed outright, while the older birds suffered terribly from the force of the hailstones, a number having their eyes completely smashed. The service in the Parish Church at Ripe had to be stopped for a time at the height of the storm, as it was quite impossible to hear anything in the church but the incessant rattling of the hailstones on the roof. The storm appears to have passed through the Cuckmere Valley, in a line from Seaford to Heathfield, reports of the fall of hailstones of abnormal size having been made at each of these places. Curiously enough, just at the mouth of the Cuckmere river scarcely any hail fell.

SHORT NOTES TENDING TO DEFINE THE AREA OF THE STORM.

Berwick.—At Sherrington Manor the damage to glass is said to be £100.

Brighton.—No hail.

Eastbourne.—No hail.

Hailsham.—No hail.

Jevington.—No hail.

Littlington.—No hail of importance, and R only 0·04 in.

Selmeston.—Much damage was done here. Hail came down with terrific force. The stones were of enormous size, some measuring five inches in circumference, and weighing over an ounce. Panes of glass were broken in all directions, in cases of exposed cottages every pane being smashed, branches were broken off trees, young rooks were knocked dead from their nests, while ducks and fowls were killed in considerable numbers. Crops and vegetation suffered heavily.

OTHER STORMS IN SUSSEX.

Haywards Heath.—The feature of the thunderstorm here was the heavy downpour of rain, which flooded the lower portions of the town, the water rushing along the roads like little rivers. The manholes in the Mill Green Road were forced up, the water spurting several feet.

Wadhurst.—A terrific storm of T and H, the latter being very large indeed, passed over here. Considerable damage was done to fruit trees and vegetables, the roads were strewn with fallen leaves, and scarcely a house in the town but had several windows broken. The storm appears to have been very local, as in some parts of the parish there was no hail.

STORMS IN KENT THE SAME EVENING.

Bexley Heath.—This neighbourhood did not escape the severity of the storm on Sunday, but fortunately no serious damage resulted. A large limb of a tree in the Broadway was torn off by the severity of the storm.

Dartford.—Here, at Gravesend, and in the surrounding district, between seven and eight o'clock on Sunday evening, the storm occasioned darkness for a time, and there was a perfect deluge of rain. A large elm tree was blown down at Hawley, and considerable damage was done to the fruit trees in the neighbourhood, especially in the vicinity of Wilmington.

Gillingham.—At the Wesleyan Chapel two windows were broken with the hail, quite 1 in. in thickness. In Layfield Terrace, no fewer than 40 windows

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were broken, and great damage was done in other outlying parts. The northern portion of the storm that passed over Strood-hill does not appear to have been so severe. In the town, except a few brilliant flashes of lightning and heavy claps of thunder, little was felt of the effects of the storm.

Hunton.—The hops on Stone Wall Farm escaped damage, but considerable injury was done to over 100 acres on the Hunton Court Estate, and about the same on Buston and Grove Farms. At Buston Farm the ground was covered with gooseberries. In several houses panes of glass were broken—at Mr. O. Foreman's no fewer than 15 squares were broken. Mr. Foreman says he found hailstones weighing an ounce.

Maidstone.—Soon after six a heavy mass of clouds congregated over the town, and lightning and thunder became excessively bright and loud, and hailstones fell as large as walnuts, doing immense damage. The storm travelled eastward from Maidstone, but opened and passed each side of Blue Bell-hill.

REMARKABLE HAILSTONES.

To the Editor of the "Morning Post."

SIR,—In reply to your Correspondent relative to remarkable hailstones, I may state that the same hailstorm passed over this town between seven and 7.30 p.m. on Sunday, May 30. The hailstones were similar in size to those your Correspondent describes. The noise of the hail was so great that the services in nearly all the churches were interrupted. I was myself taking Service at one of our district churches, and had to signal to the congregation to sit, as it was impossible to continue the hymn we were singing, no sound being heard of either music or voices above the clatter of the hail. It was accompanied by sharp flashes of lightning, but the thunder was inaudible from the same cause. Twenty minutes after the storm had ceased, when we came out from Service the hail stones were still lying in heaps by the roadside as large as shillings, and had rings of opaque white in the lumps of ice like cat's eyes. Great damage must have been done to the hops, and to glass, as well as to the fruit.—Yours, &c.,

E. DALISON.

St. Michael's, Maidstone, June 9th.

Rainham.—Here and at Bredhurst, Boxley and New Brompton hailstones fell of an immense size. In New Brompton the streets were covered with these hailstones, which took some time to thaw.

Sevenoaks.—The storm on Sunday night was very keenly felt here. The water rushed in torrents down the hills, and the thunder was very loud, while the lightning was awfully vivid and frequent. A large tree in Hitchen Hatch-lane was struck by lightning, and fell right across the road. The Town Surveyor (Mr. J. Mann) at once employed some men to remove the obstruction, but this could not be done until the tree had been sawn into pieces, and the branches lopped off. Oak-lane was completely flooded for a short time.

Tenterden.—A thunderstorm of short duration passed over this neighbourhood on Sunday evening. An oak tree near Smallhythe School was struck by the lightning, having the bark on one side taken clean off. A sheep was killed in a field not far distant.

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STORMS AND DAMAGE IN OTHER COUNTIES.

NORTHAMPTON.—*Oundle.* The TS was so severe and the streets were so flooded that many persons could not leave the church after service.—*Peterborough.* Heavy TS, with much R, after 7 p.m.; streets flooded.

ESSEX.—*Clacton.* TS at 9 p.m., but not much R. *Colchester.* Brilliant L between 8 and 9 p.m.; not much R.

SUFFOLK.—*Bury St. Edmunds.* Sharp TS and heavy R about 9 p.m.

LINCOLN.—*Billingborough.* Heavy TS.—*Walcot.* Sheep killed by L.—*Deeping St. James.* Youth killed by L while driving, horse not hurt.

GENERAL CONCLUSIONS.

Over England E. of a line from the Isle of Wight to Lincoln thunderstorms of more or less intensity occurred between 5 and 9 p.m. on May 30th.

The principal ones were in Kent and Sussex.

By far the most noteworthy occurred over an area less than 4 miles from E. to W., about midway between Newhaven and Beachy Head, and 8 miles from S. to N.; how much less than this area there is not at present evidence to prove.

Neither the T and L nor R was exceptional. but the H was so.

THE SIZE OF THE HAILSTONES.

There is a general consensus of opinion that the circumference of the large ones exceeded 4 inches, and two different photographs sent to us give respectively 7·8 in. and 6·4 in. as the circumference—this of course gives a diameter of about 2 inches, and as they were mostly somewhat oval, we think that they must have been (as they appear in the photographs) very nearly the size of an ordinary hen's egg—say 2¼ in. by 1½ in. by 1 in. They would, therefore, contain about 4 cubic inches of ice, and weigh very nearly 2 ounces each. It will be noticed that one writer says that ten weighed a pound—this would give 1·6 ounces each, and agrees very closely with our estimate of the size. We see that one is stated to have weighed "nearly a quarter of a pound," and another account says "three or four ounces." We have no doubt that the largest exceeded two ounces, and think that probably a very small number reached three ounces, but we see no evidence which will induce us to go to "four" ounces. In size, shape, and weight these stones seem to have closely resembled those which fell at Richmond, Surrey, August 3rd, 1879,* and at Richmond, Yorkshire, July 8th, 1893,† but if these falls are to be classed according to the magnitude of the stones, we think that Richmond, Surrey, would be first, and if by number of large stones, Richmond, Yorkshire, would be first. It is, however, certain that the Seaford fall was quite an exceptional event.

* *Met. Mag.*, Vol. XIV., p. 97.

† Russell, Rollo, *On Hail.* Photographs facing p. 224.

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HEAVY RAINFALL AT PORT ELIZABETH, CAPE COLONY, MAY 5TH, 1897.

FROM copies of the *Port Elizabeth Advertiser*, of May 8th, and of the *Cape Times*, of May 12th, with which we have been favoured, we have compiled the following note.

There had been a drought for some months in the neighbourhood of Port Elizabeth. On the night of Monday, May 3rd, the wind went to S.W., black clouds came up from the ocean, and there was steady rain, giving at the Hill station 0·53 in., up to 8 a.m. on the 4th. During the 4th, and up to 8 a.m. on the 5th, intermittent rain gave a total for the 24 hours of 1·34 in. It was raining hard at 9 a.m. on the 5th, but towards 11 a.m.

"the sky grew blacker away to the westward, and the rain began to come down in real earnest. At noon every street in the town was inundated, every sluit and gully was the course of a foaming torrent, and the low lying clouds were discharging their watery load in such amazing quantity that one would truly have believed that 'the fountains of the great deep were broken up and the windows of heaven opened.' The lower part of the town was for a couple of hours converted into a reservoir, fed by millions of gallons of rainwater plunging madly, feet deep, down every steep descent from the larger "catchment area" above the crest of the hill. Things were bad enough on the level surface above the Reserve, but the scene was tame compared with what we saw in every avenue leading to the lower level. The Park and all the district between the valley and the location, were a swamp. Rain fell absolutely in solid masses, and in finding level the floods of water did incalculable, almost incredible, damage. Down White's Road, Donkin Street, Constitution Hill, and Russell Road came seething, roaring, waist-deep cascades, ripping up roadways and footpaths and paved sluits like channels of sand; tearing great gaps in the surface, scooping out hundreds of tons of subsoil, laying bare and smashing gas and water mains and pipes, and hurrying along on their red and discoloured surface great boulders, beams of wood, lumps of asphalte, and everything that was loose, no matter what its weight, to deposit all this *débris* in wild confusion on the surface of Main and Strand Streets. In the former thoroughfare, about half-past twelve midday, the scene was really grand, though not without a touch of awe at this outbreak of Nature's resistless forces. Down every slope of road or lane were rushing muddy torrents, in many places waist-deep; the rain was driving along from the N.W. in sheets, forming a watery curtain which no eye could pierce for more than fifty yards; rocks and stones were being hurled into the middle of the road with the rattling roar one hears only on a shingle beach when heavy seas are breaking; on the low side the pent-up flood was finding its way into stores, cellars, hotels, and sheds, despite every effort to stay its inrush; and a few hardy people, drenched to the skin, gathered under the lee of corner buildings to watch the grandly-gloomy scene, or waded along the drowned footpaths, too wet to care for the extra soaking. So the storm raged for an hour or more, until a shift of wind to about N.E. brought relief; the surcharged clouds drove away out to sea, and by half-past one the sun was shining hotly in a clear sky. Such a waste of desolation in the leading thoroughfares of Port Elizabeth that same sun has never before shone upon. From Market Square to North End, Main Street at short intervals resembled

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nothing so much as a stretch of rough foreshore—sand was deposited several inches deep on the lower side, while the roadway was strewn with (no exaggeration) hundreds and hundreds of tons of stones, boulders, and gravelly *detritus* washed down from above."

The rainfall between 8 a.m. and 1.30 p.m. on the 5th was 5·32 in., and the observer says that, but for the wind sweeping the rain over, rather than into, the gauge, the total would have been six inches in six hours.

During the ten years 1886–95, the largest yearly total was 27·94 in. in 1888, and in 1895 the total for the year was only 16·88 in.

At the Van Staaden Waterworks Reservoir the fall was much less, the fall on the 5th being 3·65 in., against a total at Hill station of 5·44 in. From the following little note the fall seems to have been local :—

RAINFALL.

The following rainfall returns, measured at eight a.m. on 4th, 5th, and 6th May, 1897, are supplied by the Meteorological Commission : Cape Agulhas, 0·20 inch ; Cape St. Francis, 3·75 inches ; Port Elizabeth, 7·29 inches ; East London, 0·75 inch ; Durban (5th), 0·30 inch.

REVIEWS.

The Great Lakes as a Sensitive Barometer. By NAPIER DENISON. [Toronto, 1897], 8vo. Excerpt Proc. Canadian Institute.

A Probable Solution of the Secondary Undulations found upon Self-recording Tide Gauges. By NAPIER DENISON. [Toronto, 1897], 8vo. Excerpt Proc. Canadian Institute.

THESE are two early notes respecting a study of the seiches on Lake Huron, not merely in connection with the traces of a photographically recording barometer, but also with the weather types prevailing at the time over North America. The author is improving his appliances for observation by adding an extra sensitive barometer and in our opinion the inquiry is likely to bear good fruit. Mr. Denison's paper is, we think, the first in which the principal authorities upon the subject have been brought together—from Duillier in 1730 to De Saussure 1779, Vaucher 1804, Forel, Studer, Meyer, Favre, Veine, Guthrie, Kelvin, and Helmholtz. We can suggest one name—and one only—to be added to this list—viz., that of Mr. H. C. Russell, F.R.S., who has long been studying the oscillations of Lake George, which is about 130 miles S.W. of Sydney, New South Wales. In completing his work the author may find it useful to consult the paper by Sir John Lubbock "On the Fluctuation of High Water due to changes in the Atmospheric Pressure," (Phil. Mag. 1837, pp. 195, 196); J. C. Ross "On the effect of the Pressure of the Atmosphere on the Mean Level of the Ocean," with 2 plates, (London, 1854, 4to, 12 pag.): Mr. W. H. Wheeler's report to the British Association (Liverpool, 1896), "On the effect of Wind and Atmospheric Pressure on the Tides," and a paper by M. F. L. Ortt, of The Hague, in *Nature*, May 27th, 1897.

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ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday afternoon, May 19th, at the Rooms of the Royal Astronomical Society, Burlington House, Mr. E. Mawley, F.R.H.S., President, in the chair.

The first paper read was by Mr. C. V. Bellamy, "*On the Rainfall of Dominica, West Indies.*" After a brief description of the physiography of the island, the author discussed at length the rainfall at about 20 stations for the four years 1893 to 1896, illustrating the distribution by a shaded map. The Trade Wind, blowing from the Atlantic and bearing a vast amount of aqueous vapour, is intercepted by the ranges of hills, so that the country on their windward or eastern slopes receives the greatest amount of rain, while that on the leeward or western side of the island is the driest. The map shows a mean fall over the western coast districts of from 60 to 90 inches, over the north, west, and south coast districts of from 100 to 150 inches, and over the central area, the fall is greater, probably exceeding 200 inches. Table VI. gives the mean monthly rainfall for the four years; it shows that the rainy season extends over the months of July, August, September, October, and November; the remaining seven months representing the dry season. The mean monthly rainfall varies from 4·46 in. in February to 15·84 in. in November. The author expresses the opinion that hurricanes are of less frequent occurrence now than formerly.

The second paper was by Mr. R. H. Scott, F.R.S., and Mr. F. Gaster, "*On the Mean Monthly Temperatures of the British Isles.*" The authors dealt with the means of the daily minimum, average, and maximum temperatures for the various months of the year, in the 25 years 1871—1895. They pointed out that there is a great difference between the amount of range of temperature at the coast stations and that recorded inland. The range between January and July amounts to about 16° at coast stations, but to more than 23° at inland stations. The contrast between the temperature of the air at inland and at coast stations at different times of the year is due to the following causes—(1) The constant tendency of the sun to heat the surface of the earth; (2) the equally constant tendency of the earth to radiate its heat into space—both of these being modified greatly by the aqueous vapour and the clouds suspended in the atmosphere; (3) the fact that the solid portions of the earth absorb and reflect heat much more rapidly than the water; and (4) that while the ocean to the westward is of enormous size and great depth, the sea to the eastward is, comparatively speaking, limited in area and shallow, and separates the eastern shores of the British Islands from those of continental Europe by only a small distance.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, DECEMBER, 1896.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	51·8	26	26·6	19	44·5	34·3	36·4	87	61·1	20·8	3·61	21	7·4
Malta	68·6	7	43·6	2	62·3	52·3	50·1	82	117·2	38·0	3·99	11	6·8
Mauritius	86·6	19*a*	65·6	2	84·8	71·9	67·0	72	136·4	55·4	1·15	7	5·8
Calcutta	83·7	1	45·5	22	78·0	54·7	52·4	62	139·0	35·3	·00	0	2·0
Bombay	90·0	20	63·2	31	85·9	71·9	65·4	65	136·8	51·9	·00	0	2·5
Ceylon, Colombo	90·2	...	70·5	14	87·5	74·0	72·5	81	146·0	68·0	11·76	22	6·2
Melbourne	98·9	23	47·0	15	78·3	56·3	52·6	63	153·8	35·0	1·16	6	5·5
Adelaide	104·4	22	48·0	7	83·6	59·3	50·8	50	164·0	37·0	1·48	4	3·8
Sydney	101·4	28	58·4	8	77·8	64·4	58·7	70	156·0	52·8	1·50	12	5·4
Wellington	77·0	29	44·0	25	68·1	56·1	53·0	72	133·0	35·0	2·61	8	4·3
Auckland	83·0	14	53·0	5	74·4	59·6	57·1	70	147·0	51·0	·88	6	4·0
Jamaica, Kingston	90·9	6	66·8	30	87·6	71·0	68·7	74	...	...	2·14	9	...
Trinidad	91·0	2	67·0	27	87·0	70·1	72·2	82	167·0	66·0	6·33	15	...
Grenada	86·0	4	71·0	1	82·3	73·5	72·6	81	155·0	...	11·12	25	4·0
Toronto	48·9	12	1·1	23	33·8	21·3	24·2	80	60·0	— 2·0	·95	9	7·1
New Brunswick, Fredericton	44·9	14	—10·7	23	24·6	5·6	11·0	72	...	...	1·18	7	3·5
Manitoba, Winnipeg	40·0	11	32·7	1	20·6	0·8	...	...	...	...	·27	5	5·3
British Columbia, Esquimalt	55·0	8	29·0	16	46·8	38·5	41·8	95	...	...	10·41	24	3·8

a—and 21.

REMARKS.

MALTA.—Adopted mean temp. 56°·5, or 0°·2 above the average. Mean hourly velocity of wind 11·4 miles. Thunderstorm and hail on 20th. Average temp. of sea 62°·5. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·4 above, of dew point 0°·9 below, and rainfall 3·84 in. below, their respective averages. Mean hourly velocity of wind 10·9 miles, equal to average; extremes, 24·7 on 20th and 1·6 on 22nd; prevailing direction, E.S.E. to E. by N. Lightning on 4th, 8th, and 29th. Rainfall the least fall in December from 1875 to 1896. T. F. CLAXTON.

CEYLON, COLOMBO.—Lightning was seen on 10th and 11th; thunderstorms occurred on 17th, 18th, and 19th. ALFRED E. WACKRILL.

Adelaide.—Mean temp. 0°·4 above the average of 39 years. The severe drought continued until early morning of 27th, ·72 in. of R being recorded at 9 a.m. 27th, and ·70 in. on 28th; the average for 39 years being ·85 in. C. TODD, F.R.S.

Sydney.—Rainfall 1·08 in. below, temp. 1°·2 above, and humidity 0·6 above, their respective averages. H. C. RUSSELL, F.R.S.

Wellington.—Early part generally fine, with occasional light rain; middle of month showery; latter part fine. Prevailing N.W. winds at times strong. R. B. GORE.

Auckland.—An exceedingly hot and dry December, the mean temp. being 4°·5 above the average, and the rainfall only one-third of the average.—T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Mean hourly velocity of wind 3·2 miles. Rainfall of Kingston and the Island generally a little over the average. R. JOHNSTONE.

TRINIDAD.—Rainfall 1·52 in. above the 30 years' average. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, MAY, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	1·32	XI.	Rhayader, Nantgwillt ...	1·73
II.	Dorking, Abinger Hall .	1·57	,,	Lake Vyrnwy	2·20
,,	Birchington, Thor	·71	,,	Corwen, Rhug	...
,,	Hailsham	1·23	,,	Criccieth, Talarvor	1·35
,,	Ryde, Thornbrough	2·02	,,	I. of Man, Douglas	1·51
,	Emsworth, Redlands ...	1·44	XII.	Stoneykirk, Ardwell Ho.	1·89
,	Alton, Ashdell	1·51	,,	New Galloway, Glenlee	1·94
III.	Oxford, Magdalen Col..	·92	,,	Moniavie, Maxwelton Ho.	2·72
,,	Banbury, Bloxham	1·36	,,	Lilliesleaf, Riddell	1·45
,,	Northampton, Sedgebrook	·83	XIII.	N. Esk Res. [Penicuick]	1·95
,,	Duddington [Stamford].	1·08	XIV.	Glasgow, Queen's Park..	2·66
,,	Alconbury	1·40	XV.	Inverary, Newtown	4·38
,,	Wisbech, Bank House...	·80	,,	Oban, The Corran	3·64
IV.	Southend	1·00	,,	Islay, Gruinart School...	1·41
,,	Harlow, Sheering..... ...	1·33	XVI.	Dollar.....	1·77
,,	Colchester, Lexden	·82	,,	Balquhidder, Stronvar...	4·47
,,	Rendlesham Hall	·62	,,	Ballinluig	1·46
,,	Rushall Vicarage	·59	,,	Dalnaspidal H.R.S.....	4·23
,,	Swaffham	...	XVII.	Keith H.R.S.....	1·98
V.	Salisbury, Alderbury ...	1·41	,,	Forres H.R.S.	1·04
,,	Bishop's Cannings	1·13	XVIII.	Fearn, Lower Pitkerrie..	1·49
,,	Blandford, Whatcombe .	1·82	,,	N. Uist, Loch Maddy ...	2·06
,,	Ashburton, Holne Vic...	2·23	,,	Invergarry.....	1·73
,,	Okehampton, Oaklands.	1·74	,,	Aviemore H.R.S.	2·09
,,	Hartland Abbey	1·74	,,	Loch Ness, Drumnadrochit	2·50
,,	Lynmouth, Glenthorne.	1·46	XIX.	Invershin	3·40
,,	Probus, Lamellyn	1·28	,,	Scourie	...
,,	Wellington, The Avenue	1·12	,,	Watten H.R.S.....	1·35
,,	Wincanton.....	1.98	XX.	Dunmanway, Coolkelure	2·63
VI.	Clifton, Pembroke Road	1·65	,,	Cork, Wellesley Terrace	1·40
,,	Ross, The Graig	1·24	,,	Killarney, Woodlawn ...	2·55
,,	Wem, Clive Vicarage ...	·85	,,	Caher, Duneske	1·60
,,	Cheadle, The Heath Ho.	1·51	,,	Ballingarry, Hazelfort...	2·17
,,	Worcester, Diglis Lock	1·03	,,	Limerick, Kilcornan ...	1·24
,,	Coventry, Kingswood ...	1·62	,,	Broadford, Hurdlestown	...
VII.	Grantham, Stainby	1·11	,,	Miltown Malbay	2·12
,,	Horncastle, Bucknall ...	1·22	XXI.	Gorey, Courtown House	1·18
,,	Worksop, Hodsock Priory	·88	,,	Athlone, Twyford	1·39
VIII.	Neston, Hinderton	1·12	,,	Mullingar, Belvedere ...	·81
,,	Southport, Hesketh Park	1·44	,,	Longford, Currygrane...	1·89
,,	Broughton-in-Furness ...	2·94	XXII.	Woodlawn	2·29
IX.	Ripon, Mickley.....	·96	,,	Crossmolina, Enniscoe ..	2·70
,,	Melmerby, Baldersby ...	1·13	,,	Collooney, Markree Obs.	2·51
,,	Scarborough, Observat'y	·88	,,	Ballinamore, Lawderdale	...
,,	Middleton, Mickleton ...	1·44	XXIII.	Warrenpoint.....	1·12
X.	Haltwhistle, Unthank...	1·67	,,	Seaforde.....	1·56
,,	Bamburgh	1·72	,,	Belfast, Springfield	2·32
,,	Keswick, The Bank.....	2·43	,,	Bushmills, Dundarave..	2·21
XI.	Llanfrechfa Grange	..	,,	Stewartstown	1·92
,,	Llandovery	1·64	,,	Killybegs	3·67
,,	Castle Malgwyn	1·43	,,	Lough Swilly, Carrablagh	2·48
,,	Builth, Abergwesyn Vic.	2·04			

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MAY, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·08	— ·82	·41	30	9	78·0	18	33·9	1	0	5
II.		Maidstone (Hunton Court)...	1·21	— ·17	·25	29	9	...	...	...	...	...	...
,,		Strathfieldsaye	1·14	...	·30	31	10	...	...	...	...	...	...
III.		Hitchin	1·12	— ·83	·32	30	11	69·0	25	31·0	12	3	...
,,		Winslow (Addington)	·85	— 1·25	·21	31	11	72·0	25	32·0	4, 12	2	9
IV.		Bury St. Edmunds (Westley)	1·26	— ·49	·21	11	10	68·0	30	28·0	13	...	...
,,		Norwich (Brundall)	·91	...	·26	11	14	74·0	30	34·6	11	0	7
V.		Weymouth(LangtonHerring)	1·42	— ·19	·39	29	11	73·0	18	36·0	13	0	...
,,		Torquay (Cary Green)	...	...	...	...	...	...	...	...	...	...	...
,,		Polapit Tamar [Launceston]..	1·39	— ·44	·22	29	13	72·3	18	28·4	13	1	4
VI.		Stroud (Upfield)	1·52	— ·52	·47	28	11	69·0	21	37·0	3	0	...
,,		ChurchStretton(Woolstaston)	1·19	— 1·68	·31	29	14	67·5	24	31·0	11	3	9
,,		Tenbury (Orleton)	1·00	— 1·55	·30	29	13	72·0	25	30·0	13	2	11
VII.		Leicester (Rotherby Hall) ...	1·02	...	·30	29	10	...	...	...	...	...	...
,,		Boston	1·08	— ·64	·55	30	9	75·0	31	31·0	12	1	...
,,		Hesley Hall [Tickhill].....	1·13	— ·91	·54	31	13	71·0	21	31·0	12	2	...
VIII.		Manchester(PlymouthGrove)	1·85	— ·50	·42	28	13	71·0	22*a*	32·0	11	1	3
IX.		Wetherby (Ribston Hall) ...	...	...	...	...	...	...	...	...	...	...	...
,,		Skipton (Arncliffe)	3·31	— ·41	·92	28	16	...	...	...	...	...	...
,,		Hull (Pearson Park).	1·40	— ·48	·48	29	10	68·0	31	31·0	11	2	2
X.		Newcastle (Town Moor)	1·21	— ·54	·38	25	9	...	...	...	...	...	...
,,		Borrowdale (Seathwaite).....	5·89	— 2·72	1·27	4	19	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	1·30	— 1·55	·31	29	11	...	...	...	...	...	...
,,		Haverfordwest	2·42	+ ·06	·70	27	13	75·3	18	36·0	4	0	3
,,		Aberystwith (Gogerddan) ...	2·37	...	·57	27	13	74·0	18	23·0	12	11	...
,,		Llandudno.....	1·13	— ·80	·31	28	14	67·5	31	39·8	11	...	...
XII.	SCOTLAND.	Cargen [Dumfries]	2·60	+ ·08	·86	28	11	69·0	16*b*	30·4	13	2	...
XIII.		Edinburgh (Blacket Place)...	1·28	...	·40	28	14	67·9	31	33·9	13	0	6
XIV.		Colmonell	1·40	...	·39	25	12	74·0	19	27·0	12	...	...
XV.		Lochgilphead (Kilmory).....	3·21	— ·14	·68	4	15	...	...	28·0	12	2	...
,,		Mull (Quinish).....	3·95	+ 1·00	·59	28	18	...	...	...	...	...	...
XVI.		Loch Leven Sluices	1·80	— ·76	·50	29	9	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	1.35	— ·31	·50	28	14	65·8	30	32·0	7, 20	2	...
XVII.		Braemar	2·30	— ·11	·52	4	14	64·0	20*c*	29·0	27	6	21
,,		Aberdeen (Cranford)	2·39	...	·85	28	17	62·0	31	30·0	3	2	...
,,		Cawdor (Budgate)	1·59	— ·16	·38	26	14	...	...	...	...	...	...
XVIII		Strathconan [Beauly]	4·19	+ 1·10	·80	5	12	...	...	...	...	...	...
,,		Glencarron Lodge.....	5·71	...	·82	4	19	68·0	21	30·5	13	4	...
XIX.		Dunrobin	2·55	+ ·45	·49	30	17	59·0	5*g*	...	...	...	...
,,		S. Ronaldsay (Roeberry).....	1·57	— ·15	·26	28	17	63·0	16	32·0	10	1	...
XX.	IRELAND.	Darrynane Abbey.....	2·12	...	·36	26	16	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	...	...	...	...	..	...	...	...	...	...	...
,,		O'Briensbridge (Ross)	2·32	...	·49	6	15	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	1·62	— ·72	·34	6	12	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·14	— ·72	·27	6	14	63·6	16	36·2	6	0	0
XXII.		Ballinasloe	1.50	— 1·19	·25	6	15	68·0	21*d*	36·0	11*f*	0	...
,,		Clifden (Kylemore)	5·03	...	·82	30	17	...	...	...	...	...	...
XXIII		Waringstown	2·47	+ ·03	·36	26	16	74·0	16*e*	32·0	3*f*	2	10
,,		Londonderry (Creggan Res.).	2·86	+ ·34	·73	28	19	...	...	...	...	...	...
,,		Omagh (Edenfel)	..	...	...	...	...	...	...	...	...	...	...

+Shows that the fall was above the average ; —that it was below it.

a—and 23. *b*—and 22. *c*—and 21. *d*—and 22, 23. *e*—and 17, 21, 22, 24. *f*—and 13. *g*—and 6, 31.

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METEOROLOGICAL NOTES ON MAY, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

ADDINGTON.—The third May in succession with a small rainfall, very little falling until after the 25th. The low night temp. kept vegetation much in check, but there was no frost severe enough to destroy anything. One peal of T was heard on the 25th, at 2.50 p.m., and T with R on the 26th. Shower of H in the neighbourhood on the 28th.

BURY ST. EDMUNDS, WESTLEY.—A cold month, with harsh N.E. winds and sharp frost on 13th; very unfavourable for vegetation. H on 6th and 11th. TS on 25th and 30th. Distant T on 11th and 28th.

NORWICH, BRUNDALL.—A cold and changeable month, the second week being particularly unseasonable, with S on the 12th and H on the 11th, 12th, and 13th. T on the 25th and 30th, and L on the 30th and 31st.

WEYMOUTH, LANGTON HERRING.—For the first fifteen days of the month the weather was cold and dry, and up to the 24th only ·33 in. of R fell, but 1·09 in. in the last week refreshed the fields and gardens, which were parched by a long continuance of N.E. winds. The mean temp. at 9 a.m. (52°·7) is 1°·4 below the average of 25 years. Solar halo on the 17th. TS on the 19th. For the first five months of the year the rainfall is 47 per cent. above the average.

POLAPIT TAMAR [LAUNCESTON].—A rather unseasonable month on the whole; very dry during the day for the first three weeks, but cold at night. Easterly winds prevailed during the greater part of the month. A sharp frost on the morning of the 13th did considerable damage to vegetation.

STROUD, UPFIELD—Snowstorm about 6 a.m. on 11th.

WOOLSTASTON.—A very cold and dry month. Violent storm of H on 11th, followed by S. Mean temp. 50°·6.

TENBURY, ORLETON.—A very dry month, with temp. slightly below the average. The first part of the month was very cold, with frequent frosts, which did much damage to the fruit. A very large proportion of cold N. and N.E. wind.

SKIPTON, ARNCLIFFE.—A rather dry month, with cold N. and N.E. winds.

HULL, PEARSON PARK.—H on 6th, 26th, and 28th; TS on 29th, and T on 6th, 28th, 30th, and 31st.

WALES.

HAVERFORDWEST.—The first week was in pleasant sequence with the last month; a drought then set in, with strong easterly and north-easterly breezes amounting at times to the force of half a gale. The dryness of the air was remarkable, particularly so as evidenced by the readings of the wet and dry bulb from the 17th to the 24th; on the 17th the 9 a.m. readings of the hygrometer differed 13°·2, and on the other days varied from 8° to 10°; large ponds of water evaporated like magic, and had not the much-prayed-for R come, the hay and other crops would again have proved a disastrous failure. H storm on 30th, at 3.30 a.m., ·35 in. fell in 15 minutes.

ABERYSTWITH, GOGERDDAN.—Bright sunshine, with drying E. wind, from the 14th to 24th. Springs very low, but nice rains in the last few days.

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SCOTLAND.

CARGEN [DUMFRIES].—Although the temp. was very appreciably lower and the R much greater than in May of 1895 and 1896, the figures representing the meteorological conditions of the past month are chiefly remarkable as showing how very closely they correspond with the averages for May in the last 38 years. The unpleasant weather experienced in April continued during the earlier portion of May; from the 1st to the 13th the mean temp. was 45°·1, and sleet and H showers were of frequent occurrence. A welcome change took place about the middle of the month, but the effects of the higher temp (51°·9 14th to 31st) were marred by a constant succession of parching easterly winds, pastures and corn crops making little progress. A change of wind and nearly two inches of R during the last week effected marked improvement. Farm work is well advanced, but the R, it is feared, arrived too late to ensure a heavy hay crop, and pastures have seldom been barer at the close of May. The oak was just bursting into leaf at the close (this year behind the ash), and the hawthorne commencing to flower, being, with flowering shrubs generally, fully three weeks later than in the past two years. H on 4th. T in afternoon of 27th.

EDINBURGH, BLACKET PLACE.—H on 10th and 11th. Fogs on 20th, 27th, and 28th. Gale on 4th; and rainbow at 6.30 p.m. on 4th.

COLMONELL.—Rainfall 1·05 in. below, and mean temp. 0°·9 below, the averages of 21 years. T on 27th.

BRAEMAR.—Another cold and backward month.

ABERDEEN, CRANFORD.—The month was cold, with high winds and little sunshine.

CAWDOR, BUDGATE.—S and H on 6th; H also on 5th, 10th and 11th.

S. RONALDSAY, ROEBERRY.—The first half of the month was wet and very cold, the last half warmer. Mean temp. 48°·9, 1° above the average of seven years.

IRELAND.

DARRYNANE ABBEY.—A showery month, with a week of very fine, hot weather in the middle.

O'BRIENSBRIDGE, ROSS.—Wintry and cold up to the 11th, followed by brilliant sunny days until the 24th, and closing with another change to R and cold.

DUBLIN.—A cold, rather dry month, very showery at the beginning and close, fine and bright in the intervening period, with absolute drought from 12th to 24th inclusive. The prevailing winds were from polar quarters, N.W., N.E., and E. Mean temp. 50°·9, or 1°·1 below the average. Solar halo on the 24th. High winds on 12 days, attaining the force of a gale from W.S.W. on the 4th; slight fog on 20th. H on 5 days.

BALLINASLOE.—L and T at 1.45 p.m. on 29th.

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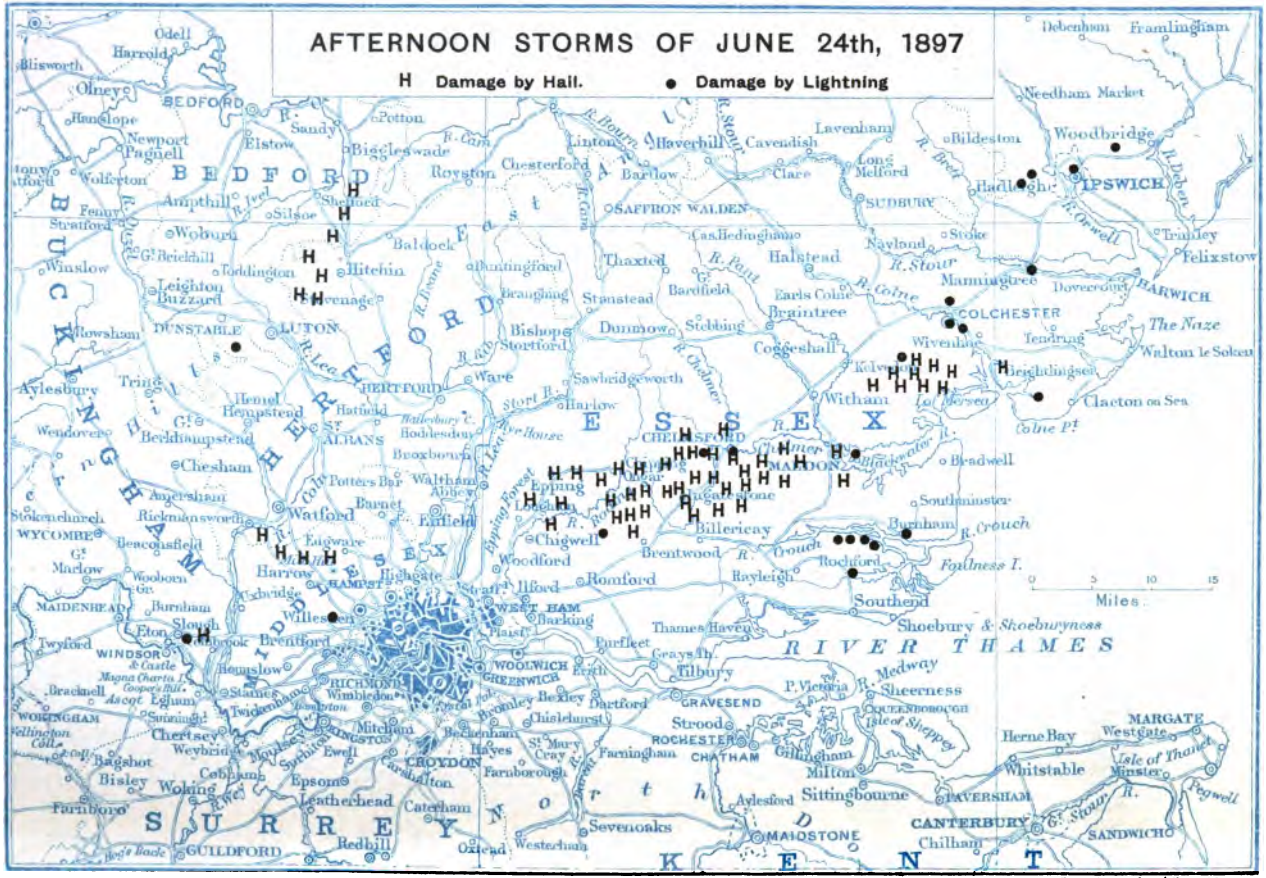

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Stanford's Geog! Estabt London

SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

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THE STORMS OF JUNE 24TH.

IT may be noticed that this title is very vague—many occurred to us, but there were objections to all—"The Essex Hailstorm" would not do for two reasons, (i.) it would not include the disasters near Luton, Bedfordshire, and (ii.) the damage was not due to hail alone, —true, there was an enormous, an unusual, amount of H, and some of it was extremely large; but the mischief arose from the great strength of the wind, which gave to the H the penetrative energy, which its mere fall by gravity would not have done.

We repudiated the title of "Whirlwind" because we cannot trace any facts which indicate horizontal vortex motion, or the expansion of confined air. The facts would probably fit in with the theory of a revolving storm of which the axis was horizontal. We have tracked H storms which seemed to support such an idea—say that of a monster steam roller passing along, but sometimes resting on the surface, and at intervals lifted above it, so that little injury was done. We objected to the title "Afternoon storm," because all was not quiet till about 8 p.m.

We have had some experience of heavy hailstorms, so that they are not quite such novelties to us as they seem to be to many persons. We can just recollect the London storm of August 1st, 1846, when skylights went, and between three and four inches of rain came through; then in the *Met. Mag.*, Vol. xiv. pp. 97 and 125, will be found details of the severe one at Richmond, Surrey, August 2nd and 3rd, 1879, with one stone 4½ inches long; but before that (we forget the date) we went to Winchmore Hill to see the wreck of one there, and remember three facts—casement windows with the lead knocked out as well as the glass—giant rhubarb stems cut right across—and a poor pony (which had been without shelter in a field) its back all lumps from the pelting which it had suffered—and there are many other cases in our previous volumes.

But we do not remember two instances within a month, of hail-stones as large as hen's eggs falling in England, as seems to have been the fact both at Seaford, Sussex, in May, and at Ingatestone, Essex, in June.

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At the end of this article we give some very condensed statements as to facts. We hope that this earlier portion is equally trustworthy, but, in order to economize space and to make it easily understood, we have arranged it as a kind of narrative.

The special feature of the early part of June 24th was its high temperature—approaching 90° in the shade. If any one should write a complete memoir of the events of this day, one point to study would be the automatic records of temperature, in order to ascertain the precise time of the sudden fall in temperature, so as to find out whether it was a cause, or a consequence, of the storms.

The earliest record of any disturbance was a shower at Twyford (Berks.), at noon. About an hour later there was a sharp TS, with very large H, at Slough (Bucks.). At 1.30 p.m. large H, L, T, and R were occurring round Uxbridge, Harrow, Stanmore and Pinner. At 1.55 the wind carried away some garden frames at Willesden; at 2.6 the captive balloon from the Royal Botanic Gardens; at 2.45 it carried away a tent a little south of Epping, Essex; at 2.55 it was wrecking Ingatestone; it reached Chelmsford at 3; Danbury at 3.10, and died out south of Colchester before 4 p.m. But this was not all—whether connected with this disturbance, or not, we do not know, probably not,—there was wreckage going on nearly at the same time (about 3.30 p.m.) along a strip of Bedfordshire, between Luton and Biggleswade, being specially bad in the parishes of Henlow and Lilley.

Later in the day, in North Surrey, Hampshire, and other adjoining counties, and along the East Coast, as far as Hull, there were TS8, with short heavy rains.

We should need an entire number to give details of the damage, so we do not make the attempt. Most persons have seen the accounts in the newspapers, and have learned from the statement in the House of Commons by the Minister for Agriculture (The Rt. Hon. W. H. Long, M.P.) that by personally driving through the Chelmsford and Ingatestone district he had been convinced that there was no exaggeration whatever.

His statement is conclusive and needs no support; but we should like to mention that we have been favoured by one of our correspondents with some beautiful photographs (by Duyshart & Co., of Chelmsford) of the damage, and they seem to us to demonstrate beyond dispute our conclusion that wind was as serious a destructive agent as the hail, and that the unusual ruin was the result of their joint action.

One great source of trouble is, that Essex has not had a bad hailstorm for some years, and therefore many of the farmers and nurserymen had given up insuring against injury by hail, and now of course are in dire distress. Not all, however, for we have heard of one man having already had from his Insurance Company a cheque for something over £880. Had all his brethren been equally careful, June 24th would have been a bad day for the companies.

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We are aware that this article is not so strictly systematic as we usually try to make our notes, but there have been two great difficulties in the way—(*a*) the enormous amount of information to be epitomized; (*b*) the fact that if all the entries were grouped either chronologically or geographically, the special features as to wind, H and L could not have been brought out. We have, therefore, adopted the following grouping:—*Selections from Correspondence*, arranged nearly in chronological order, and so giving a history of the storms; *Animals and Poultry killed; Damage by Lightning; Hail; Wind.* In these sections the entries are arranged alphabetically, and most of them refer to Essex; but that the damage in Bedfordshire was nearly as serious (though over a smaller area) may as well be proved by a specimen extract:—

Langford.—A terrific storm passed over this village on Thursday week at about four o'clock in the afternoon. The lightning and thunder were not particularly severe, but the wind and hail were most alarming, and have caused sad havoc and loss. Such a storm has not visited this village since 1843. The crops have suffered terribly, wheat and barley being broken about half-way down the straw, and have already started to prematurely ripen. Onions have scarcely a particle of luke left on them, and turnip seed and beans are ruined. Many gardens are wrecked, the vegetables being badly cut, and the fruit stripped from the trees or so badly bruised that it will be of no service. In many cases the bark of the tree is so badly bruised and cut that in all probability the trees will die. A quantity of glass was broken, and a number of young fowls and ducks were killed. Numbers of dead rooks were collected from the fields next day. The hailstones were of enormous size and very irregular in shape, many resembling rough pieces of ice with sharp edges.

Two other subjects have to be mentioned:—First, our sympathy with the sufferers. By all accounts the Essex farmers have been having hard times. The harvest of 1897 promised to make amends. Over about 100 square miles (one-fifteenth of the county) this prospect has been swept away. Granting that over only half that area is there a total loss, it still means 32,000 acres, and putting it even at £3 an acre, it means a loss of about £100,000. We have seen the amount put at more than double that sum, but it will be hard enough to raise even the £100,000 at which we have put it. The Mansion House fund will need all the help it can get.

The other subject not mentioned is the map, on which, though the scale (in order to include the whole path) is necessarily small, the sites of damage are represented with precision, as far as information has reached us. The spaces without damage between Edgware and Epping, and again S.E. of Witham, are, we believe, strictly true.

SELECTIONS FROM CORRESPONDENCE.

Twyford, Haines Hill.—Heavy shower about noon, but it gave only 0·09 in. In the afternoon (about 4.30 to 6 p.m.) a TS brought the total for the day to 0·59 in.—S. M. WEDDERBURN.

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Slough, Upton.—Violent TS at 1.15 p.m., several buildings struck and two cottages burned down. Very large H. Total R 1·31 in.
R. BENTLEY, F.R.Met.Soc.

Slough, Upton Park.—The R measured here at 2.15 p.m. was ·20 in.; by 5 p.m. there had been a further fall of ·73 in., and by 6.50 another ·47, total therefore 1·40 in.—HUGH M. BAKER.

Southall.—A little west of this place I found a large elm had been uprooted, and I was told that much large H had fallen.
K. I. MARKS, F.R.Met.Soc.

Uxbridge, Harefield Park.—Very heavy TS in afternoon; the H was not large, but over an inch of R fell in less than 30 minutes; total R 1·70 in.—W. BATCHELOR.

Stanmore, Wealdstone.—A violent TS with H, of which single stones weighed more than an ounce, began about 1.30 p.m., and lasted about an hour, but R continued till 7 p.m. Total 2·30 in. Vegetables much cut in the gardens, and many rooks stated to have been picked up dead. According to reports, the storm was most severe at Wealdstone, severe at Rickmansworth and Stanmore, and slight at Pinner.—G. E. ELAND.

Harrow Weald, Hill House.—Heavy TS with H the size of hazel nuts between 1.30 and 3 p.m. The R in those 1½ hours was 1·84 in., and the total 1.30 to 7 p.m., 2·08 in.—A. CROSSMAN.

Ealing.—About 2 p.m. [1.50 p.m. we believe.—ED.] a storm swept through Ealing, raising clouds of dust of extraordinary volume and density, and doing considerable damage to Jubilee decorations. Two hours later a TS broke with torrents of R. At the Local Board offices the fall in one hour was 1·40 in., and at Perivale 1·78 in.
C. JONES, C.E.

Willesden Green.—At 1.55 p.m. a sudden squall lifted two glass frames, used as roof to a shed, and carried them away as if they had been sheets of paper. Total R 0·34 in.—R. LAMPORT.

Kensworth [*Dunstable*].—Terrific TS, a tree and a cottage struck; no H, and only 0·05 in. of R.—S. GRACE JONES.

Broxbourne.—T, H and R, total 0·61 in.—G. J. NEWBERY.

West Kensington, Edith Road.—At about 1.30 p.m. we had a sudden dry squall, and my thermograph showed a fall of 15°. About 5 p.m. we had a TS, and at 5h. 14m. 30s. I saw what looked like a large ball of pink fire, burst like a shell upon a house opposite, knocking off part of the gable, dislodging part of the roof and breaking the window.—G. VON U. SEARLE.

Finchley, Etchingham Park.—Frequent T (but not much L) 1 to 7 p.m. Very heavy R, with H rather larger than hazel nuts, 2.5 to 2.20 p.m. Total R 0·65 in.—J. W. SCOTT.

Muswell Hill.—T for some hours in afternoon. Total R 0·32 in.
S. G. ABETHELL.

Camden Square.—Hot in morning, 87°·8 in the shade. At 2h. 0m. 36s. p.m. a sudden strong gust of wind and sudden fall of temperature of 10°, calmer till 2.5, then very rough until 2h. 9m.

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No R, L nor T, but in N.W. and N. a thick darkness covering everything. About 3 p.m. T, and thence till 6.16 p.m. L, T and R, but in no wise exceptional. Total R 0·26 in., most of which fell between 5 and 5.45 p.m.—G. J. SYMONS.

Ongar, Abbots Roding Rectory.—Total R 0·75 in.—L. CAPEL CURE.

Chelmsford, Writtle.—We have had a terrific storm here—H, R, L, T and wind. At 11 a.m. the shade temperature was 83°, and the air very oppressive; the storm so cooled the air that at 7.30 p.m. it was only 60°. At 3.3 p.m. there occurred such a storm of wind and H as I had never seen. During the storm we could do nothing but listen to the H smashing the windows, and it and the R pouring into the house. The worst of the storm was soon over, but the R continued till nearly 4 p.m., when I measured 1·42 in. At 4·10 p.m. I collected some of the stones, and measured them; the largest I saw were 1½ inches by 1 inch by ¾ in., and they did not melt till 6 p.m.

M. USBORNE.

Chelmsford, Melbourne.—In about 25 minutes during the R and H storm we registered 1·08 in. As the H would not be caught by the funnel of the gauge, I am unable to give total amount. The storm began soon after 3.0 p.m., and came from S.W. Before it reached us, it became very dark, and we could hear the roar of the storm as it approached; then a few hailstones about the size of marbles; then the storm was upon us, with L, and in half-an-hour it was all over, but as we were in the track, windows and crops were almost totally destroyed. The larger hailstones were 2 in. long by 1½ to 1¾ in. wide and ½-in. thick.—EDWARD ROSLING.

Wickford, Runwell Hall.—A little R and some H fell here about 3 p.m., but it amounted only to 0·03 in., so that the storm cannot be said to have reached here, in fact, the damaged trees along the road hence to Colchester show that the limit was about 4 miles N., in which direction, and notably over Ingatestone, it was very dark.

HENRY KEMBLE, LT.-COL.

Chelmsford, Spergula.—Total R in 15 minutes, 1·14 in.

J. C. THRESH, M.D., F.R.Met.Soc.

Chelmsford, High Street.—Terrific hailstorm, which came up like an advancing wall of ice. R 1·37 in. in 20 minutes. F. CHANCELLOR.

Braintree, Fennes.—We were about 15 miles N. of the zone of greatest intensity. Distant T at intervals from about 11 a.m. 2–3 p.m., T remarkably continuous and gradually louder. 3 p.m., T and L sharp, when nearest about 1 mile distant. R, a smart shower, no hail, ·09 in. Damage, none.

HENRY S. TABOR, F.R.Met.Soc.

Danbury Rectory, Chelmsford.—At 3 p.m. the storm was travelling from the due West to this hill, accompanied by unusual darkness, vivid forked lightning and a rushing wind, that came along in swirls and eddies rather than in one direct blast. At 3.4 p.m. rain began to fall; at 3.10 p.m. the wind was blowing a hurricane, and huge hailstones were hurled upon us; at 3.15 p.m. (about) the worst was

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over; at 3.30 p.m. the storm had passed. My rain gauge measured ·83 during the 26 minutes. I should like to observe that there were no hailstones in the funnel of the gauge when I examined it at 3.30 p.m., though the ground all round was strewn with them. (Diameter of gauge is 5 inches, height from ground 1 ft.) Owing to the velocity of the wind, the hail fell at an unusually acute angle, but why none were in the gauge I do not know. I weighed one of the hailstones, which was an average one of the larger sized ones, and it scaled ½ oz. Almost every pane of glass on the west side of the house was shivered, including a large sheet of plate glass.—J. BRIDGES PLUMPTRE.

Writtle, Little Boyton Hall.—The rainfall here was 1·34 in. We were about 500 yards out of the main hailstorm, and did not get any wind, but a few very large stones and very heavy rain; the 1·34 in. fell in 30 minutes (timed). The lightning was overhead, 10 seconds time between flash and report approximately, but during height of storm the lightning and thunder were absolutely continuous, a fact which those in the middle of the storm could not notice. The R at Writtle was 1·99 in. R. W. CHRISTY.

Hatfield Peverel, Cardfields.—I am very happy to say that Cardfields was only on the outskirts of the storm, though Fairfields (another house on my farm) had 54 windows broken out of a possible 76. The storm was preceded by a dense black cloud, travelling from N.W. to S.E., making it too dark to read, and the hail and rain began at 3.5, and at 3.25 the storm was over and the sun shining brightly, and in the 20 minutes I registered ·92 in. Some of the hailstones which fell at Fairfields were slabs of ice larger than the palm of your hand, and Mr. Edward Corder, of Writtle, told me that he measured one 4½ inches by 3½ inches which weighed 5 ozs. The centre of the storm was apparently Writtle, Blackmore, and that neighbourhood, where the crops are almost entirely destroyed.

ALF. ROSLING.

Maldon.—The storm was not at its worst here. The hailstones were all rounded at the edges, and I think did not exceed half-an-inch in diameter. Hence, we had no broken windows, nor even frame or pit lights, nor was my garden much injured. R 1·12 in., the greater part of which fell in an hour. We are 10 miles from Chelmsford, where thousands of panes of glass were broken, and at Widford and Ingatestone, 5 to 8 miles nearer London, they caught the utmost severity of the visitation. At Chelmsford I saw drawings of some hailstones, taken by Mr. Charles Pertwee, architect, which measured nine-eighths of an inch across and five-eighths in thickness. These specimens had all the appearance of pieces of broken ice, having jagged edges. The L and T were extremely severe, being almost continuous throughout the hour that the storm lasted.

THOS. ISAAC.

Colchester, Lexden.—Very severe TS, but no H. Total R 0·92 in.

S. F. HURNARD.

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Ipswich, Bishop's Hill.—Unusually severe TS, but not much H or R. G. A. BIDDELL, C.E.

Bury St. Edmunds, Westley.—Very heavy TSS; total R 0·97 in., but the storms were very partial, villages within two miles having little or no rain.—R. BURRELL.

Norwich, Brundall.—Much damage by L during a series of TSS, 3 to 6 p.m. R here only 0·07 in.

ARTHUR W. PRESTON, F.R.Met.Soc.

East Molesey, Palace Road.—R in two hours, 4.30 to 6.30 p.m., 1·55 in.—M. S. JENKYNS.

Surbiton, Vronvelin, Lovelace Road.—Between 4.45 and 6.30 p.m. R 1·96 in.—F. J. BARCLAY.

North Surrey.—The following heavy rains occurred on the 24th:—

New Malden (Sewage Works)	1·82 in.
Esher (,, ,,)	2·32 ,,
West Molesey (Chelsea Water Works)	1·96 ,,
Surbiton (,, ,, ,,)	2·12 ,,

F. CAMPBELL BAYARD, LL.M., F.R.Met.Soc.

Pirbright Camp.—A TS with H and R, 5 p.m. to 5.30 p.m.; R 0·93 in.—H. ELWICK.

Marlow.—Sudden squall of violent wind, L, T, H and R, about 6.8 to 6.15 p.m.—W. R. GOWERS, M.D., F.R.S.

Alton, Colmer Rectory.—No storm near here till about 6.30 p.m., and then only distant. At 8.5 p.m. another short and sharp, but neither H nor R remarkable.—T. HERVEY.

Alresford, Swarraton Rectory.—TS with H began in E. at 7 p.m., and worked round by N. to N.W., and by 7.50 p.m. 1·42 in. of R had fallen.—W. L. W. EYRE, F.R.Met.Soc.

ANIMALS AND POULTRY KILLED.

Essex.—The number of birds killed was enormous, and in many districts there will be no shooting. Not only were young birds drowned, but old ones were struck dead by the hailstones. Cases are on record where wood-pigeons, crows, and other birds fell from trees as if shot by guns, with their heads split open by the falling ice.

Galleywood.—Galley Hall, only a few chickens killed.

Little Baddow and District.—Mr. Charles Smoothy, of Old Riffhams Farm, Little Baddow, reports as under:—"I am sorry to say that the storm here was very destructive to game. We picked up three old partridges, and several young, in a field adjoining my house, killed by the hail, evidently while brooding their young. Some of them were cut as if they had been struck by a bullet. From the severity of the storm, which lasted about half an hour, I am sure no birds could live in the open. This storm has killed hundreds. I am afraid that sportsmen will be greatly disappointed in September. Old birds as well as young must have been killed unless they were well

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sheltered by fence or wood. There were over 200 fowls killed in the village of Little Baddow.

Margaretting Hall.—One lamb and several chickens killed.

Mundon.—Some young ducks killed by hail.

Stondon.—Halsford Bridge Farm, 12 chickens killed.

" Woolmongers Farm, 50 chickens killed.

" Paslow Wood Common, 10 young turkeys and many chickens killed.

West Hanningfield.—Many chickens killed.

Widford.—Many pheasants killed.

Wigborough.—Nine chickens killed.

Writtle.—Many chickens drowned, two goslings struck dead by hail.

DAMAGE BY LIGHTNING.

Burnham.—Mr. Read's new workshop was struck but not much damaged.

Colchester.—Chimney struck at the Ordnance Stores.

" Mile End Church, roof and clock damaged.

" Mount Cottage, Butt Road, chimney struck.

Ealing, Hanger Hill.—Oak tree struck.

Ingatestone.—Harding's Farm, chimney struck and fell through roof.

Layer de la Haye.—Oak tree struck.

Manningtree.—Brantham Mill struck, but not ignited.

Rochford.—Market Place. Roof of Mr. Ashby's house struck.

" Eastwood. Several trees struck.

" Mr. Bentall's chimney struck and fell through roof.

St. Osyth Priory.—Tower struck and clock stopped.

Wallasea.—Cottage near the schools much damaged.

HAIL.

Barking.—None.

Blackmore.—When the storm broke it caused two horses to bolt with a mowing machine, which was smashed, another pair ran away with a water-cart, knocked down three other horses, and the whole five fell into a ditch in a heap.

Chelmsford.—The hailstones were of various shapes, some globular, some oval, some oblong, some like sections of cylinders, and some exactly like small saucers, the edges resembling white lace, while the centres consisted of transparent ice, bluish in colour. Mr. Charles Pertwee picked up in the garden of his house, Claremont, London Road, two of the cylindrical shaped hailstones, which he found upon measurement to be five-eighths of an inch thick, and one and one-eighth inches across. It seemed as if rain-drops were congealed on the surfaces of the original stones. Mr. Pertwee had more than 200 squares of glass broken.

Chelmsford.—The corrugated iron shed of Messrs. Hodge and Taylor, near the railway, was so riddled by the hail that it looked as if it had been shot at. About 25 sheets of the iron were pierced.

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Danbury.—At the Rectory the hail knocked holes in the water-spouts.

Galleywood.—Flattish stones were picked up here measuring two inches square.

Ingatestone.—Mr. Arthur H. Raven says that he picked up one stone which measured 5½ inches round, and another which weighed (at the Post Office) 3½ ounces.

Ingatestone.—At Lee Farm the hail went through the slate roofing.

Ingatestone.—Mill Green Park, twenty-four hours after the hail-storm the stones lay a foot deep on the N.W. side of the house, and one taken up haphazard measured 4½ inches in circumference.

Ingatestone.—Ingatestone Hall. Mr. Coverdale thus relates his own personal experience of the storm:—"I was driving with my son and my coachman, a man named Gray. We had just got up to Mr. Kortright's house when the storm came on. We jumped out of the trap and hastened into the house. The storm descended without the slightest warning, except the blackness. First the hail and rain came down vertically, and then at a sharp angle. Down came the top of a tree at once. My man Gray—how he stood the storm I don't know—managed to get the cob under the sides of the house, and Mr. Kortright, my son, and I went out to try to assist. The hailstones immediately riddled the umbrella which I put up, and beat me back. The pony sustained a cut right down his nose. (This was a jagged wound about 1½ inches in length, and the pony's whole body was covered with lumps about the size of hen's eggs. A pailful of hailstones was gathered out of the trap). My man's chest and arms looked afterwards just as if he had had five minutes with a bruiser. They were discoloured everywhere, and full of bumps. The force with which he was struck by the hailstones may be estimated by the fact that although he was wearing a mackintosh, livery coat, sleeved waistcoat, and shirt, he is black and blue. His tall hat was dented in. My son got a crack on the head through his hat, and there was a bump on his head in a moment as big as a hen's egg."

Ingatestone.—Mill Green. The roof of Mrs. Du Cane's house looked as if some one had gone along and broken the tiles with a hammer.

Kelvedon Common.—Several hailstones were measured by Mr. Brenes, some of them more than 2¼ inches across.

Layer Breton.—Hail as large as walnuts.

Little Baddow.—At Cuckoo's Farm, at 3 p.m., the hailstones were the size of a hen's egg—they smashed a stable window, and so pelted the horse that he nearly went mad; one stone struck a chicken dead at one blow.

Little Baddow.—On Saturday (about 48 hours after they had fallen), Mr. Mecklenburg found in a ditch hailstones which weighed more than half an ounce.

Little Baddow.—Mr. C. Smoothy says that the hail not merely came through his windows, but cut the blinds to shreds. After they

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had been lying some time, he measured one 6½ inches in circumference.

Maldon.—A man driving some ladies had on a hard hat, it was cut through in four places by the hail, and the ladies' umbrellas were riddled.

Margaretting.—Mr. Bright reports hailstones 6 inches round.

Margaretting Hall.—Mr. D. Christy said :—"I was on the top of that haystack when the storm broke. The wind blew away the poles and ladders, and there I had to stay! Two trees close to the stack were twisted and blown about to such an extent that I expected them to come down upon the stack every moment. One or two trees were blown down quite close to me, but I did not hear them, owing to the noise of the wind and hail. One of my old men (Cheek), who is of the same age as the Queen, was caught in the storm, and his arms and body were beaten black and blue by the hail. He has been in bed until this morning, unable to get up. Five other men took shelter under a tree, but when they saw a tree on each side of them blown down, they rushed into the open. Two of my horses bolted with a wagon which overturned into a ditch, and we had to take the wagon to pieces before we could get it out again."

Navestock.—Mr. Long measured a hailstone 4½ inches in circumference.

Ongar.—Cattle have been injured by being pelted with the hail, which drove them nearly wild.

Springfield.—A lady was driving her pony cart, the pony was frightened by the hail and bolted (fortunately homewards), the next day the lady found her shoulders and back stiff and sore from the fusillade of hailstones.

Stock.—Mr. Barton was with a cart, the horse, frightened by being hit by the hail, bolted, and the cart was upset, neither horse nor man was hurt by that, but afterwards a hailstone struck Mr. Barton on his felt hat, and through it, raised a large bump. Some of the stones were as large as hen's eggs.

Theydon Bois.—A hailstone was picked up at Birch Hall which measured 3 inches by 1½ inches.

Writtle.—A hailstone cut through a man's hat and inflicted such a gash that it had to be sewn up.

Writtle.—Skeggs Farm. Mr. Milbank says that he was out in the storm, his straw hat was cut to pieces, his arms, back, and head covered with bruises; four days after the storm there were bruises black and green 3 inches square.

WIND.

Abridge.—Storm lasted from 2.45 to 3.30 p.m.; heavy rain; tent blown down.

Blackmore.—At Spriggs' Farm 30 trees were blown down, one was 4½ feet in diameter. A barn 60 feet long was blown down.

Braintree.—No wind.

Great Baddow.—Six elms blown down—four in one group. On

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Great Sir Hughes Farm the top was taken off a tree and dropped on a cottage roof, which it broke in.

Ingatestone.—At Harding's Farm 20 large trees uprooted and many others had tops off.

Ingatestone—In Hyde Park about 20 large trees uprooted and 150 broken.

Ingatestone.—Nearly every private house was damaged, not merely the windows but the roofs, and by overthrown trees. At Mill Green a large frame covered with tiffany was whirled over a clump of trees 30 feet high and carried 60 yards.

Ingatestone.—At Jordan's Farm about 300 tiles were blown off.

Ingatestone.—Mr. Howell, baker, was driving his cart; it was blown over and he was bruised from head to foot. [Probably partly by the fall and partly by the hail.]

Mill Green.—At Mr. Du Cane's house all three chimneys down, one fell through the roof on to a bed.

Mountmessing.—Trees uprooted and blown in all directions.

Stock.—Chimney pots were blown off, stacks overturned, roofs carried away, and trees torn up.

West Hanningfield.—A wagon had just been loaded with clover hay; seeing the hail, the horses were taken out to put them into shelter; this had hardly been done when the wagon was blown over.

Writtle.—At Skeggs' Farm a wagon with two tons of hay upon it was blown completely over; the windmill was so much damaged that it is of no further use, and will have the sails removed.

METEOROLOGY IN BELGIUM.

THE June number of *Ciel et Terre* contains, under the title of *L'Observatoire au Parlement*, a very interesting survey of the present state of Meteorology; but we do not like it, it is too humble. Meteorology has won an honoured position in almost every civilized country in the world, and certainly not least in Belgium, though as yet there is in that country no separate meteorological office, and M. Lancaster writes as if he were pleading for one. If his countrymen understood the subject there would be no need to plead, the office would be created forthwith. Moreover, we are further puzzled because M. Lancaster quotes two able speeches in Parliament in favour of separating the Astronomical and the Meteorological branches of the National observatory, so as to create a seperate Meteorological department, and says nothing as to any objections being raised thereto. If opposite views were expressed, we think that they should have been set out, and dealt with in the article. But as far as we can see the arguments are unanswerable, and so, perhaps, by this time all is, as it should be, settled, and Belgium has its *Bureau Météorologique.*

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THE RECENT AUSTRALIAN AND INDIAN EARTHQUAKES.

By PROF. J. MILNE, F.R.S.

THE mails which have recently arrived from Australia, bring long accounts of a severe shock which, on May 10th, shattered chimneys, loosened bricks, cracked ceilings and created alarm in South Australia. The vibrations extended eastwards to Victoria and New South Wales, and from the numerous time-observations which were made, it is clear that sufficient material has been collected to determine the centrum from which the shock emanated. From the character of the movement and its effects, as noted in Adelaide, it seems likely that the origin will be found at a distance of 150 or 200 miles to the south of the same, and, therefore, be sub-marine.

The Australian and other colonies require not only seismographs, but the equivalent of the instrument employed in the Isle of Wight; and the reasons they require them are manifold. Had there been instruments of this type in Australia in 1888, when cable communication with the rest of the world was interrupted for a period of 19 days, it would at once have been known that the cause of this interruption was seismic, and not an operation of war, with the result that the calling out of military and naval reserves would, together with other expenses, have been avoided.

Since 1876 the cables connecting Australia and Java have been interrupted at least eighteen times, and on several of these occasions, when two or more cables were broken simultaneously, we know the cause to have been earthquake movements, producing submarine landslides.

The photograms of the unfelt movements throw light upon disturbances often noted in the records of various instruments employed at observatories. They also help us to confirm, extend, correct, and sometimes disprove, ordinary telegraphic information; but their chief value is that they furnish the means of calculating the velocities with which motion is propagated along different paths *through* our earth, which factors throw new light upon the effective rigidity of the globe on which we live.

The Indian earthquake, which recently wrought much havoc in Assam, announced itself in the Isle of Wight before half-past eleven on the morning of Saturday, June 12th. The movement continued for several hours, and the seismogram is the largest I have yet obtained. A record of this disturbance might have been obtained anywhere on the surface of the globe.

In Greenwich mean civil time, the commencement of movement was in the Isle of Wight at 11h. 29m. 10s.; at Edinburgh at 11h. 18m. 0s.; at Strasburg at 11h. 18m. 32s., and at Grenoble at 11h. 28m. 0s. I should estimate the apparent rate at which the preliminary vibrations were transmitted from Assam to Western

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Europe, at 7 to 8 km. per second, or that they took *about* 16 minutes on this journey. If this is the case, the primary shock took place in Assam, in Greenwich time, at 11h. 2m. 0s., or 11h. 12m. 0s. a.m. The origin of this disturbance was in the Cherra Hills, about 240 miles N.E. from Calcutta, or on the convexity of the orogenic fold which runs from Burma, in the south, to Eastern Assam, in the north. The great earthquake of 1869 originated in the same region.

Shade Hill House, Newport, I. of Wight.

WINTERS IN BERWICKSHIRE.

[We have recently been favoured by Mr. W. Hewat Craw, of West Foulden, Berwickshire, with the following table. It seems to us not merely interesting in itself, but suggestive of a guide to winter severity, which would be very useful if adopted generally, and which may even be found so for years when the thermometric records were untrustworthy or non-existent.—Ed.]

Note of the time when the Hill stock (black-faced sheep) required to be fed with hay during snowstorms on the farm of Rawburn, Berwickshire, 1883-1897 :—

Winter.	No. of days when haying was needed.	Days between which sheep required hay.
1883—84	—	No hay required; snow did not lie so deep as to prevent the sheep feeding.
1884—85	16	From 10th to 26th January.
1885—86	34	From 25th Jan. to 11th Feb., and from 2nd to 19th March.
1886—87	19	From 10th to 18th January, and from 14th to 25th March.
1887—88	28	From 21st Feb. to 21st March.
1888—89	5	From 1st to 5th March; one hirsel only.
1889—90	—	No hay required; a mild, open winter.
1890—91	10	From 17th to 27th March.
1891—92	—	No hay required.
1892—93	4	From 27th February to 3rd March.
1893—94	—	No deep snowstorms, but changeable, with severe frosts.
1894—95	54	From 10th January to 5th March. Severe winter, with deep snow.
1895—96	—	No hay feeding needed from deep snow.
1896—97	24	In December, 10 days, from 11th to 21st. In Jan. and Feb, 14 days, from Jan. 21st to Feb. 4th.

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ROYAL METEOROLOGICAL SOCIETY.

THE last meeting of this Society for the present session was held at the Rooms of the Royal Astronomical Society, Burlington House, on Wednesday afternoon, June 16th, Mr. E. Mawley, F.R.H.S., President, in the chair.

A paper by Mr. R. C. Mossman, F.R.S.E., on "The Non-Instrumental Meteorology of London, 1713–1896," was read by the Secretary. The data were obtained from :—

I. Register kept at Richmond, Surrey, from April 1713 to June 1745, by Mr. George Smith, a Proctor to Queen Anne.*

II. A daily record given in *The London Magazine* from 1747 to 1758.

III. Register printed monthly in the *Gentleman's Magazine*, 1763–1771. The station from November to April was near the north bank of the Thames, just below London Bridge. During the other half of the year, it was situated seven miles west of Hyde Park Corner.

IV. Registers kept by Mr. Thomas Hoy at Kensington, 1771–1774; Muswell Hill, 1775–1782 ; and Sion House, near Kew, 1783–1822.

V. Register kept at Greenwich by Mr. J. H. Belville from March 1st, 1811, to July 7th, 1856.

VI. Daily weather notes from Greenwich Observatory, published in the Registrar-General's *Weekly Return of Births, Marriages, and Deaths*, 1855–1896.

The phenomena tabulated were Thunderstorms, Lightning without Thunder, Mist and Fog, Snow, Hail, Gales and High Winds.

The thunderstorms show an average number of 10 per annum. The maximum was 25 in 1878 and 1880, and the minimum 1 in 1729. The maximum in one month was 12 in June 1726. The annual period is well marked, embracing the six months April to September, during which time 91·5 per cent. of the whole took place. The maximum occurring in July, and the minimum in February.

The total number of fogs was 4,076, an average of 24 per annum. They increase rapidly during September, but the maximum is not clearly defined, the values for October, November and December being practically the same. The minimum is reached in June.

The total number of days with snow was 2,267, an average of 14 per annum.

The snowiest winter was that of 1887–88 with 43 days, while in the winter of 1862–63 there is not a single instance of a snowfall. The greatest number of falls in one month was 17 in January 1814.

The mean date of first snowfall is November 9th; the earliest date being September 24th in 1811; and the latest April 10th in 1834. The mean date of last snow is March 30th, the extreme dates being January 6th, 1894, and May 27th, 1821.

Hail is essentially a spring phenomenon, reaching a maximum in

* See *Met. Mag.*, Vol. xxxi. p. 161.

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March and April. The minimum is in July and August. It is probable that most of the cases in summer are falls of true hail accompanying thunderstorms, whereas in spring in nearly every case the substance precipitated is "graupel" or soft hail. The total number of falls observed was 988, equal to an average of 6 per annum.

Mr. C. Harding gave an account of the hailstorm which occurred in the south-west of London on April 27th, 1897. This accompanied a thunderstorm in which the lightning was very vivid. The hail lasted only about 20 minutes, from 6.30 to 6.50 p.m., and in that short space of time the melted hail and rain amounted to about an inch of water. The ground was quite white with hailstones, which in some places remained unmelted the whole of the next day. Much damage was done to fruit trees and shrubs. The paper was illustrated by a sketch-map, shaded to show the area over which hail was observed; extending over a length of about six miles from New Malden to Tulse Hill, and varying in width from about half-a-mile at the S.W. end, to about a mile-and-a-half at the N.E. end, and including Wimbledon, Tooting, Balham, Streatham and Brixton. The stations recording a precipitation of more than an inch were Streatham 1·62 in. and Clapham Park 1·18 in.

THE FROST—EARTH TEMPERATURES & WATER PIPES.

THIS heading does not seem appropriate to Midsummer, but it is only now that the anomaly to which we called attention in April, 1895, has been explained—very unsatisfactorily.

In the *Meteorological Magazine*, Vol. XXX., p. 39, we gave a table of "Earth temperatures at 1 foot in February, 1895," and we made the following remark:—"In the above table the stations are grouped in the order of their mean temperature [for the month] and some results are remarkable. The coldest station, Lowestoft, 29°·0, is within a short walk of the hottest but one, Somerleyton, 33°·8. We believe that the thermometers at both stations have been verified, but think that reverification is desirable."

To-day, June 30th, 1897, we have received the April number of the *Quarterly Journal* of the Royal Meteorological Society, and on page 96 we find the explanation of the whole matter, in the following report by Mr. Marriott. The italics are ours.

"Lowestoft, September 4 [1896]. On comparing the thermometers it was found that the wet had gone up 0°·2. The 1 foot and 2 feet earth thermometers have long tubes surrounded by wooden or metal cases. I had not previously been able to test these thermometers, but on this occasion, with the assistance of Mr. Miller, I succeeded in doing so. *I found that the* 1 *foot thermometer had slipped down its case about* 3° *and was consequently reading much too low.* The 2 feet thermometer was fully 1° too high."

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JANUARY, 1897.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	TotalRain. Depth.	TotalRain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	47·0	10	23·4	18	39·8	31·7	34·0	93	69·0	16·6	2·05	20	7·3
Malta	66·6	9	39·4	31	60·1	49·1	47·2	82	124·3	32·3	1·05	10	5·6
Mauritius	88·0	18	69·6	31	84·9	74·6	71·1	78	135·7	62·2	6·35	17	7·0
Calcutta	87·7	15	49·0	19	79·8	57·5	53·6	61	140·5	41·2	·04	...	1·6
Bombay	88·8	9	61·1	20	81·1	67·1	63·7	69	134·6	51·2	·01	1	2·0
Ceylon, Colombo	92·2	6	68·0	13	89·2	73·9	71·2	76	152·0	65·0	3·81	8	3·1
Melbourne	102·2	7	46·5	17	74·0	56·2	52·7	68	150·8	38·2	5·46	9	6·0
Adelaide	105·1	30	51·7	24	82·4	59·3	51·3	52	162·6	40·5	·66	4	4·6
Sydney	90·3	22	51·6	18	78·2	64·3	58·4	63	154·8	44·2	2·15	13	4·4
Wellington	81·0	12	45·0	1	71·6	57·8	53·0	66	145·0	35·0	8·05	11	4·1
Auckland	...	...	...	...	...	...	...	...	...	...	...	...	..
Jamaica, Kingston	89·5	18	62·0	12	85·7	66·6	62·6	66	...	...	·02	1	2·6
Trinidad	90·0	5*a*	64·0	3*b*	87·3	67·6	68·4	76	171·0	62·0	·75	11	...
Grenada	87·8	10	70·0	21	82·2	72·5	72·8	83	155·0	...	6·10	20	3·0
Toronto	51·7	3	—7·2	25	29·7	15·6	21·6	87	62·5	— 9·3	1·92	15	8·0
New Brunswick, Fredericton	55·3	5	—18·0	19	24·2	3·8	13·0	75	...	...	3·45	10	4·8
Manitoba, Winnipeg	38·0	1	—38·4	23	8·5	—12·0	...	...	...	...	·89	9	5·2
British Columbia, Esquimalt	51·3	7	22·2	27	42·6	34·6	37·2	93	...	...	5·95	20	3·2

a—and 11. *b*—and 4, 15

Remarks.

Malta.—Adopted mean temp. 53°·8, or 1°·0 above the average. Mean hourly velocity of wind 11·6 miles. Average temp. of sea 59°·0. TS on 19th. L on four days. Severe hailstorm on the 23rd, at 1.5 a.m. Hailstones of dense ice, reaching in size to that of a hen's egg, fell for several minutes. Much damage was done to skylights and windows of westerly aspect. Three hundred and twenty panes of glass were destroyed in this College in about five minutes. J. F. Dobson.

Mauritius.—Mean temp. of air 0°·6 above, of dew point 1°·2 above, and rainfall ·94 in. below, their respective averages. Mean hourly velocity of wind 8·4 miles, or 2·8 miles below average; prevailing direction E.S.E. and E. by N. T and L on 13th. L on 1st and 16th, and T on 7 days. T. F. Claxton.

Ceylon, Colombo.—Lightning was seen on 6th and 7th; thunderstorms occurred on the 24th. Alfred E. Wackrill.

Adelaide.—A remarkably cool month. Mean temp. 3°·6 below the average. Rainfall ·19 in. below the average. C. Todd, F.R.S.

Sydney.—Rainfall 1·51 in. below, humidity 9 below, and mean temperature 0°·2 below, their respective averages. H. C. Russell, F.R.S.

Wellington.—On the whole a wet month, with interval of fine warm weather; heavy rain in the middle and at the end of the month, 3·20 in. being recorded on the 15th. Strong N.W. winds prevailed, and gales or high winds on ten days. Earthquake on 14th. R. B. Gore.

Trinidad.—Rainfall 1·27 in. below the average of 30 years. J. H. Hart.

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SUPPLEMENTARY TABLE OF RAINFALL, JUNE, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	3·84	XI.	Rhayader, Nantgwillt ...	3·10
II.	Dorking, Abinger Hall.	1·66	,,	Lake Vyrnwy	4·29
,,	Birchington, Thor	1·55	,,	Corwen, Rhug	...
,,	Hailsham	2·15	,,	Criccieth, Talarvor	3·18
,,	Ryde, Thornbrough	3·08	,,	I. of Man, Douglas	4·76
,,	Emsworth, Redlands ...	3·06	XII.	Stoneykirk, Ardwell Ho.	4·92
,,	Alton, Ashdell	2·53	,,	New Galloway, Glenlee	4·75
III.	Oxford, Magdalen Col..	2·40	,,	Moniavie, Maxwelton Ho.	4·67
,,	Banbury, Bloxham	2·61	,,	Lilliesleaf, Riddell	3·35
,,	Northampton, Sedgebrook	2·39	XIII.	N. Esk Res. [Penicuick]	4·45
,,	Duddington [Stamford].	2·17	XIV.	Glasgow, Queen's Park..	5·67
,,	Alconbury	1·75	XV.	Inverary, Newtown	6·70
,,	Wisbech, Bank House...	2·03	,,	Oban, The Corran	4·99
IV.	Southend	2·64	,,	Islay, Gruinart School ...	1·67
,,	Harlow, Sheering..... ...	2·53	XVI.	Dollar.....	6·19
,,	Colchester, Lexden	2·62	,,	Balquhidder, Stronvar...	5·74
,,	Rendlesham Hall	2·31	,,	Ballinluig	4·95
,,	Rushall Vicarage	1·92	,,	Dalnaspidal H.R.S.....	5·76
,,	Swaffham	...	XVII.	Keith H.R.S.....	4·99
V.	Salisbury, Alderbury ...	2·93	,,	Forres H.R.S.	2·77
,,	Bishop's Cannings	3·69	XVIII.	Fearn, Lower Pitkerrie..	1·94
,,	Blandford, Whatcombe.	3·96	,,	N. Uist, Loch Maddy ...	1·32
,,	Ashburton, Holne Vic...	3·53	,,	Invergarry.....	2·40
,,	Okehampton, Oaklands.	2·55	,,	Aviemore H.R.S.	3·93
,,	Hartland Abbey	2·36	,,	Loch Ness, Drumnadrochit	3·21
,,	Lynmouth, Glenthorne.	3·10	XIX.	Invershin	1·57
,,	Probus, Lamellyn	1·99	,,	Scourie	...
,,	Wellington, The Avenue	2·35	,,	Watten H.R.S.....	1·02
,,	Wincanton.....	2·78	XX.	Dunmanway, Coolkelur	5·36
VI.	Clifton, Pembroke Road	3·22	,,	Cork, Wellesley Terrace	3·10
,,	Ross, The Graig	3·20	,,	Killarney, Woodlawn ...	4·31
,,	Wem, Clive Vicarage ...	2·38	,,	Caher, Duneske	4·19
,,	Cheadle, The Heath Ho.	3·13	,,	Ballingarry, Hazelfort...	3·52
,,	Worcester, Diglis Lock	2·78	,,	Limerick, Kilcornan ...	...
,,	Coventry, Kingswood ...	2·93	,,	Broadford, Hurdlestown	4·27
VII.	Grantham, Stainby	2·20	,,	Miltown Malbay	...
,,	Horncastle, Bucknall ...	1·68	XXI.	Gorey, Courtown House	2·67
,,	Worksop, Hodsck Priory	2·76	,,	Athlone, Twyford	4·43
VIII.	Neston, Hinderton	2·58	,,	Mullingar, Belvedere ...	4·08
,,	Southport, Hesketh Park	3·28	,,	Longford, Currygrane...	4·68
,,	Broughton-in-Furness ...	7·58	XXII.	Woodlawn	5·21
IX.	Ripon, Mickley.....	3·02	,,	Crossmolina, Enniscoe ..	3·96
,,	Melmerby, Baldersby ...	3·11	,,	Collooney, Markree Obs.	4·74
,,	Scarborough, Observat'y	2·05	,,	Ballinamore, Lawderdale	6·07
,,	Middleton, Mickleton ...	2·74	XXIII.	Warrenpoint.....	6·00
X.	Haltwhistle, Unthank...	3·79	,,	Seaforde..	5·88
,,	Bamburgh	2·50	,,	Belfast, Springfield	5·99
,,	Keswick, The Bank.....	4·38	,,	Bushmills, Dunlarave..	5·68
XI.	Llanfrechfa Grange	3·17	,,	Stewartstown	6·71
,,	Llandovery	2·56	,,	Killybegs	8·36
,,	Castle Malgwyn	2·79	,,	Lough Swilly, Carrablagh	5·10
,,	Builth, Abergwesyn Vic.	3·29			

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JUNE, 1897.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Night below 32°. In shade.	On grass.
		inches.	inches.	in.								
I.	ENGLAND. London (Camden Square) ...	1·87	— ·14	·68	8	11	87·8	24	43·3	10	0	0
II.	Maidstone (Hunton Court)...	...	...	...	...	...	...	...	...	...	...	...
,,	Strathfieldsaye	2·04	...	·92	8	10	...	...	...	...	...	...
III.	Hitchin	2·33	+ ·47	·88	8	13	81·0	23	41·0	18	0	...
,,	Winslow (Addington)	2·55	+ ·69	1·01	8	12	84·0	13	40·0	10	0	0
IV.	Bury St. Edmunds (Westley)	2·94	+ 1·15	·97	24	11	75·0	23	43·0	19	0	...
,,	Norwich (Brundall)	2·23	...	·61	18	14	83·0	24	43·4	19	0	0
V.	Weymouth(LangtonHerring)	2·94	+ ·71	·89	8	9	76·0	25	45·0	17	0	...
,,	Torquay (Cary Green)	...	...	...	...	...	...	...	...	...	...	...
,,	Polapit Tamar [Launceston]..	1·73	— ·48	·44	19	12	78 0	25	41·7	3	0	0
VI.	Stroud (Upfield)	2·44	+ ·05	·72	8	12	80·0	23*b*	45·0	18	0	...
,,	ChurchStretton(Woolstaston)	2·73	+ ·18	·81	8	13	78·0	13*c*	42·0	17	0	0
,,	Tenbury (Orleton)	2·32	— ·30	·66	9	11	83·0	12	42·0	10	0	0
VII.	Leicester (Rotherby Hall) ...	2·05	...	·54	8	14	...	...	...	...	...	...
,,	Boston	1·92	+ ·03	·38	8	12	88·0	23	42·0	21	0	...
,,	Hesley Hall [Tickhill].....	3·03	+ 1·11	1·42	30	16	84·0	13	39·0	10	0	0
VIII.	Manchester(PlymouthGrove)	3·62	+ ·97	·72	1	13	85·0	23	39·0	8	0	1
IX.	Wetherby (Ribston Hall) ..	3·83	+ 1·94	1·14	6	15	...	...	...	...	...	...
,,	Skipton (Arncliffe)	5·38	+ 2·02	·85	19	17	...	...	...	...	...	...
,,	Hull (Pearson Park).	1·57	— ·18	·36	19	10	83·0	12*d*	39·0	10	0	...
X.	Newcastle (Town Moor)	2·82	+ 1·18	·70	18	13	...	...	...	...	...	...
,,	Borrowdale (Seathwaite).....	9·03	+ 2·45	1·90	15	18	...	...	...	...	...	...
XI.	WALES. Cardiff (Ely).....	3·13	+ ·70	·86	8	12	...	...	...	...	...	...
,,	Haverfordwest	3·14	+ ·58	·72	17	16	78·2	23	43·5	3	0	0
,,	Aberystwith (Gogerddan) ...	2·26	...	·49	16	10	83·0	12	33·0	1,2	0	...
,,	Llandudno.....	2·30	+ ·53	·68	17	17	76·2	13	43·4	5	0	...
XII.	SCOTLAND. Cargen [Dumfries]	3·36	+ 1·41	·92	15	12	75·2	5	38·0	19	0	0
XIII.	Edinburgh (Blacket Place)...	3·99	...	1·00	13	21	73·4	5	36·0	8	0	0
XIV.	Colmonell	5·22	...	1·61	15	21	77·0	13	42·0	8*e*	0	...
XV.	Lochgilphead (Kilmory).....	7·51	+ 4·41	1·69	15	20	...	...	36·0	18	0	...
,,	Mull (Quinish).....	3·28	— ·01	·82	15	19	...	...	...	...	...	...
XVI.	Loch Leven Sluices	4·90	+ 3·15	1·30	16	11	...	...	...	...	...	...
,,	Dundee (Eastern Necropolis)	5·10	+ 3·60	1·45	15	19	71·9	2	39·5	19	0	...
XVII.	Braemar	4·19	+ 2·20	·75	15	18	74·0	29	37·2	1	0	6
,,	Aberdeen (Cranford)	3·80	...	·86	16	16	72·0	28	38·0	6	0	...
,,	Cawdor (Budgate)	3·63	+ 2·23	·89	15	17	...	...	...	...	...	...
XVIII	Strathconan [Beauly]	2·39	— ·10	·74	16*a*	8	...	...	...	...	...	...
,,	Glencarron Lodge.....	3·23	...	·92	22	13	74·7	29	34·8	9	0	...
XIX.	Dunrobin	1·54	— ·48	·41	15	9	70·0	12	41·0	7	0	...
,,	S. Ronaldsay (Roeberry).....	·56	— 1·20	·10	11	12	68·0	29	38·0	7	0	...
XX.	IRELAND. Darrynane Abbey.....	4·91	...	1·13	19	25	...	...	...	...	...	...
,,	Waterford (Brook Lodge) ...	2·79	+ ·72	·83	8	14	74·0	5, 30	41·0	19	0	...
,,	O'Briensbridge (Ross)	3·62	...	·74	8	14	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	3·60	+ 1·76	·81	29	15	...	...	...	...	...	...
,,	Dublin (FitzWilliam Square)	3·26	+ 1·60	·66	8	20	73·7	22	43·0	19	0	0
XXII.	Ballinasloe	5·37	+ 3·07	1·38	23	21	71·0	5	43·0	17	0	...
,,	Clifden (Kylemore)	6·77	...	1·32	15	15	...	...	...	...	...	...
XXIII	Waringstown	5·11	+ 3·04	·87	15	21	79·0	5	40·0	18	0	0
,,	Londonderry (Creggan Res.).	6·15	+ 3·73	1·70	15	20	...	...	...	...	...	...
,,	Omagh (Edenfel)	7·41	+ 4·94	1·41	15	21	73·0	5	40·0	18	0	...

+Shows that the fall was above the average ; —that it was below it.

a—and 22. *b*—and 24. *c*—and 23. *d*—and 13. *e*—and 16, 24.

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METEOROLOGICAL NOTES ON JUNE, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail S for Snow.

ENGLAND.

CAMDEN SQUARE.—In some copies of our last number the second figure of the date of the min. temp. in May had disappeared; it should have been not 1 but 13.

ADDINGTON.—Rainfall above the average of ten years. Great range of max. temp. at times, between the 6th and 8th as much as twenty-five degrees, and between the 24th and 25th twenty-two degrees. T on 1st and 24th.

BURY ST. EDMUNDS, WESTLEY.—A hot month with much growing weather. Vegetation made great progress, and the country looked lovely at the close. Remarkable for the heavy TS of the 24th, which though very severe here was very partial, villages within two miles having little or no rain. Distant T on 6th.

NORWICH, BRUNDALL.—The month entered with fine warm weather. The 7th and 8th were very wet and cold, followed by warm weather. A gale of unusual violence for June occurred on the night of the 18th, and TSS on 18th, 24th and 27th. Much destruction was done in Norwich by the storm of the 24th, both to life and property, and buildings were damaged by L on the evening of the 27th, at Blofield, one mile from this station. The max. temp. on 8th, 50°·6, is the lowest recorded in June since 1886.

WEYMOUTH, LANGTON HERRING.—The mean temp. at 9 a.m. is 0°·8 above the average. The hay crops in this neighbourhood are the heaviest that have been known for many years, and the grain crops promise well. There was a severe TS on the 26th, which lasted for more than seven hours, the flashes of L following each other in quick succession. T also was heard on the 24th and 28th. Very high wind on the 18th. Fog on 27th. The rainfall for the first six months of the year, 18·17 in., is with the exception of 1879, when 20·43 in. fell, the heaviest in that period in 23 years, is 45 per cent. above the average for the first half of the year, and nearly three times that of the corresponding period in 1896.

POLAPIT TAMAR [LAUNCESTON].—Generally a fine, very seasonable month. Distant T very frequent during the last week.

STROUD, UPFIELD—Very heavy R from 11 a.m. to 1 p.m. on 1st, ·54 in. falling in the two hours. TS in evening on 26th; heavy TS at night on 28th, with vivid L.

WOOLSTASTON.—A very variable month with repeated and very abrupt changes from sultry heat to cold stormy weather. T on the 6th. Gale on the 18th. Mean temp. 58°·8.

TENBURY, ORLETON.—A fine warm month, with mean temp. about 2°·5 above the average. T on 6th, 24th and 30th.

ROTHERBY HALL.—Total R for first 6 months 11·24 in., against 7·71 in. in 1896.

WALES.

HAVERFORDWEST.—Fine bright hot weather in the first week, followed by nearly a fortnight of broken weather, which was most acceptable to the country, and contributed to the realization of the splendid hay crops, and to every likelihood of a magnificent harvest. Fine, bright, warm weather, with some heavy falls of R at night, closed this most seasonable June. Distant TS on 13th.

ABERYSTWITH, GOGERDDAN.—Bright sun, with S. or S.W. wind, most of the month.

SCOTLAND.

CARGEN [DUMFRIES].—The mean temp. of the month was 1°·5 above the average. The constant and sudden fluctuations of temp. were very remarkable;

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on no less than six occasions was there a difference of upwards of 10° in the maximum temp. of succeeding days. The duration of sunshine was greatly below the average. Light winds, mostly easterly, prevailed during the month. Farm crops have hardly ever had a better appearance at this season. Warm weather constantly following R caused luxuriant growth, and corn, hay, and turnip crops promise to be much above the average. T and L on 1st and 29th. T on 2nd and 13th.

EDINBURGH, BLACKET PLACE.—The coldest June since 1888, and the wettest since 1879. The rapid alterations of heat and cold were of frequent occurrence. Fog on six days. TS on 13th and 14th. Mean temp. on 20th, only 45°·5. Very heavy R at 10 a.m. on 16th, ·44 in. fell in 16 minutes, and the temp. fell till 2.30 p.m., when it was 43°·4.

COLMONELL.—Rain 2·46 in above, and mean temp 0°·5 above, the average of 21 years.

LOCHGILPHEAD, KILMORY.—The wettest month of June remembered, without reference to records; very low temp. also at times.

BRAEMAR.—A dark and wet, but fine growing month.

ABERDEEN, CRANFORD.—Generally cold and cloudy; gale, with R, on 16th, 17th, and 18th.

S. RONALDSAY, ROEBERRY.—A very dry month. Mean temp. 51°·3, being 0°·9 below the average of seven years.

IRELAND.

DARRYNANE ABBEY.—A very wet month, with extremely heavy falls of R for a few hours on 19th and 23rd. On the 19th almost all the fall was between 9 a.m. and 1 p.m., and caused great floods. On 23rd most of the fall was between 9 and 11 a.m. Constant thick mist and fog in the last fortnight.

WATERFORD, BROOK LODGE.—Temperature much below that of last year. Heavy TS on 12th; T and L on 28th. Fog on 27th, 28th, and dense fog on 30th.

O'BRIENSBRIDGE, ROSS.—Remarkable for extreme variations of temp., frequent summer L without T.

DUBLIN.—Although the R and rainy days were in excess of the average, and the amount of cloud was large, June, 1897, must be regarded as a favourable month, conducive to health, and propitious to vegetation. It is remarkable that with a preponderance of easterly and north-westerly winds, the relative humidity was very high, and radiation temperatures by night were not low. There was a cold spell from the 15th to the 20th. Mean temp. 58°·7, or 0°·9 above the average. High winds were noted on seven days, but the force of a gale was attained only on the 16th and 19th. Fogs on seven days. TS on the 12th, and L on 22nd. Solar halos on the 5th and 28th.

BALLINASLOE.—Gales from W. on the night of the 15th and all day on 16th, at night on 17th, and all day on 18th and 19th. L and T and heavy R from 10 to 11.30 p.m. on 22nd and L and T at 8 p.m. on 23rd.

WARINGSTOWN.—The wettest June since observations began in 1861, the next wettest being June, 1879, when 4.54 in. fell.

EDENFEL.—The rainfall (7·41 in.) of the past month has not been equalled in any spring or summer month in 33 years, and during that time has been only twice exceeded in any month of the year, viz., by 7·70 in. in October, 1870, and 7·67 in. in December, 1876. As it came after the turnip sowing and before the hay harvest, but little actual damage has been occasioned, except in the lands adjoining mountain torrents, where in many instances the seeds were washed out of the ground. Vegetation is profuse, but there is quite an ominous paucity of flower on all fruit trees, plants and flowering shrubs. Temperatures have been rather below the average, and everything is nearly a month later than last year. The rainfall of the six months, 23.57 in., is the heaviest yet recorded in that period.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXIX.] AUGUST, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

FROMONDUS AND HIS NOTES ON THE WEATHER.

A RECENT number of *Ciel et Terre* contains the only modern notice which we remember to have seen of Professor Libert Froidmont, of Louvain.* The article, like nearly all those which appear in our Belgian contemporary, is well worth reading, but there are one or two points upon which the author (Prof. Monchamp) may be glad of a little information, and possibly by drawing attention to the article here, still further particulars may be forthcoming.

Prof. Monchamp regards the record of the weather kept by Froidmont in 1614 and in 1625 as "the earliest kept in Belgium, if not in the world." Has he forgotten "Tyge Brahe's Meteorologiske Dagbog, holdt paa Uraniborg for Aarene 1582—1597"?

Everybody did not secure a copy of Merle's MS., so it may be well to give wider circulation to a specimen month, nearly 300 years earlier than Froidmont:—

Record of the Weather at Driby, Lincolnshire, by the Rev. W. Merle, A.D. 1343.

March 1.—Frost, with little snow, and afterwards light rain.
,, 2.—Slight fog.
,, 3 & 4.—Slight frost, with little hoar-frost.
,, 5.—Light rain, with N.W. wind.
,, 6 & 7.—Very strong S.W. wind.
,, 9.—Very strong S.W. wind, with rain.
,, 13.—Very strong S.E. wind, with rain.
,, 15.—Little hoar-frost, with strong W. wind.
,, 16.—Strong W. wind in the night.
,, 17.—Very strong W. wind, with rain.
,, 19.—Very strong W. wind, with light rain.
,, 20.—Little hoar-frost, with little ice.
,, 21.—Little hoar-frost.

* Libertus Fromondus was Dr. of Theology, and Prof. of Philosophy and Theology in the University of Louvain. He was born on the 3rd (or 6th) of September, 1587, at Hackör on the Maas (Haccourt, near Liège, Belgium), and died at Louvain, near Brussels, October 27th, 1653.

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March 25 & 26.—Stormy, that is to say, very strong N.W. wind, with cold and with hail, rain, and snow many times in the day.

,, 27.—Slight hoar-frost, with N.W. wind, before mid-day; after mid-day, serenity without wind, followed by light rain, with light thunder once.

,, 28.—Stormy, with very strong N.W. wind, and with hail, rain and snow very often in the day. At mid-day there was an earthquake, which was so great that, in certain parts of Lyndesay, stones in the chimneys fell down, after shaking in very great agitation, and it lasted long enough for the "Salutatio angelica" to be said distinctly.

,, 29.—Stormy, with hail, snow, frost, rain and N.W. wind.

,, 30.—Severer frost than on the 29th, with snow and wind.

,, 31.—Heavier snowfall than on the 30th, with N.W. wind, and there was a good deal of snow then.

The aforementioned earthquake was not felt at Oxford.

We shall be glad of information as to editions of Froidmont's book. We have the first five of the following six; are there any others?

FROMONDI, LIBERTI. Meteorologicorum libri sex.

			Size of Type.
A	4to.	Ex Officina Plantiniana, Antverpiæ 1627, xii.-438 pp.	7·1in. × 4·3in.
B	sm. 8vo.	Guilielmus Turner, Oxoniæ, 1639, xiv.-527 pp. ...	4·9 ,, × 2·7 ,,
C	4to.	Hieronymi Nempæi, Lovanii 1646, xii.-591 pp. ...	6·9 ,, × 4·3 ,,
D	sm. 8vo.	Ed. Story, Londini, 1656, xiv.-527 pp.	4·9 ,, × 2·6 ,,
E	sm. 8vo.	J. Redmayne, Londini, 1670, viii.-464 pp.	5·4 ,, × 3·2 ,,
F	4to.	... ... Londini, 1670...	

Prof. Monchamp quotes only editions A and C, and a London edition of 1655, of which we can trace no other copy. Is it a mistake? or was D issued in 1655 as well as in 1656? It will be noticed that, besides giving what we believe to be the forms (4to, 8vo, &c.) of each volume, we give the length and breadth of a full page of type—*i. e.*, without head-lines or marginal notes. We have long regarded the 4to, 8vo, &c., as confusing, and are glad to quote the following authority against them :—"At the recent International Congress of Publishers in Paris the inexactness of designating the size of books as 4to, 8vo, and 12mo, was discussed, and a resolution was passed to the effect that publishers' catalogues should give the actual sizes of volumes, in the metric system."—*Science*, July 23rd, 1897.

De La Lande in his *Bibliographie Astronomique* calls edition B 12mo. D is once described as 12mo, but generally as an 8vo, though the dimensions are very small for that, and E is described by one authority as 8vo, and by another as 18mo!

We think that one sentence in Prof. Monchamp's interesting note is incorrect, but as the Editors have passed it, we are almost afraid

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to criticize. However, we venture on reprinting it, and putting in italics the statement to which we object.

"Il cite (p. 79) un témoin digne de foi qui, au milieu d'une nuit de l'automne de 1625, a vu une longue traînée lumineuse partir de l'occident, s'élever jusqu'au zénith, et faire pâlir la Lune, qui pourtant brillait alors de tout son éclat. *Il s'agit sans doute ici de la lumière zodiacale.*"

Surely the zodiacal light never shone at midnight brightly enough to dim the light of the moon. Would not the passage of a bright meteor accord better with the statement?

Prof. Monchamp gives a diagram of the winds according to Froidmont, which we commend to the attention of Mr. J. G. Wood, in case he should feel inclined to carry further the interesting consideration of the subject which he gave in Theophrastus.

We agree with Prof. Monchamp in his concluding paragraph, which may be freely paraphrased as follows:—

In finishing my little paper, I would advise those interested in Meteorology to read the whole of Fromondus's book. Meteorology has, of course, made great progress in nearly 300 years, but all the theories and facts are not to be despised; even the errors are useful, they show us the road travelled, and the pits to be avoided, they should render us cautious both as to our theories and our facts, if we wish to be respected when another 300 years have passed.

RECENT STORM RAINS.

IN two consecutive numbers we have had to deal with hail of quite exceptional size, falling during the storms in Sussex and Essex, and now we have some equally remarkable rainfall records.

July 20th.

OXFORD.

St. Giles', Oxford.—TS from 3.45 to 5 p.m. and 1·30 in. of R, 1·14 in. falling by 4.45 p.m.—E. M. TAWNEY.

The fall at *Magdalen College* was 0·83 in., and at the *Radcliffe Observatory* 1·66 in.

DEVON.

Water Works, Torquay.—On July 20th we had a very heavy fall of rain on our watershed, viz., 3·02 in. at Tottiford, and 1·40 in. at Kennick. Of the 3·02 in. at Tottiford, 2·75 in. fell in 70 minutes, and at the same time there was a heavy fall of hail, some of the stones being quite an inch across. A large amount of soil was washed into our reservoirs, and no less than 186 cubic yards found its way into the Intake. The storm appeared to have its centre between the village of Lustleigh and our reservoirs, and the roads suffered severely.—W. INGHAM, A.M.I.C.E.

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GLOUCESTER.

Upfield, Stroud.—Very severe TS from 4.30 to 5.30 p.m. R in that hour 1·62 in., and 0·33 in. more in the following two hours. Within a mile of here a tree, a brick wall and a brick chimney stack were struck, and a sheep was killed by L.—ROSE E. STANTON.

Further Barton, Cirencester.—Three heavy TSS took place: The first at noon, over in about an hour, when ·27 in, of R fell. The second began with T in the S.W. before 2.30 p.m.; at 3 p.m. two trees were struck by L about half-a-mile distant; the storm passed round to the E. The third came up also from the S.W.; R and H began at 5 p.m.; two violent claps of T, instantaneous with the L, at 5.15 p.m. and 5.30 p.m., when a Scotch fir had a strip of bark peeled off from top to bottom. The H stones caused great damage to apples and all vegetation; they were chiefly round, some with sharp points, but not pyramidal. Bar. steady; no wind. Total R 1·43 in.—E. BROWN.

NORTHUMBERLAND.

Pawston, Coldstream.—R 2·13 in., the heaviest fall in 24 hours since September, 1880. In the three days 19th to 21st, 3·10 in. fell, practically all in 48 hours.

July 21*st.*

MIDDLESEX.

Fairfield Road, Crouch End.—Severe TS, with heavy R and H the size of large peas or small marbles. Between 2.15 p.m. and 4.15 p.m. 1·90 in. of R fell, and in the 24 hours 2·09 in. Water found its way into the basements of houses where it had never been seen since they were built in 1887.—H. SOWERBY WALLIS.

Aubrey Road, Crouch End.—During the heavy TS here this afternoon exactly 2·00 in. of R fell (between 2 and 5 p.m.), the heaviest R being between 3 and 4.—W. B. BUTLER.

Finsbury Park.—Between 1.15 and 3.45 p.m. there fell 2·10 in. of R, of which, probably, two inches fell between 1.30 and 3.30 p.m. Between 3.45 and 5.30 p.m. there was a further fall of 0·43 in., making the total in less than four hours 2·53 in. At *Lordship Road, Stoke Newington*, in the same time there fell only 1·68 in.—EDMUND L. MORRIS, A.M.I.C.E.

Cazenove Road, Stoke Newington.—After the storm, my rain gauge recorded 3·18 in. For at least ten years no such amount has been measured in North London.—E. J. BENTLEY.

Camden Square is within three miles of all these stations, but the fall there was only 0·01 in.

BERKS.

The Elms, Faringdon.—Heavy TS, 0.30 to 1.25 p.m., in which time the R was 1·20 in. At Coleshill (Wilts), three miles off, there was no R.—W. DUNDAS.

BUCKS.

Addington, Winslow.—TS, a cow and a sheep killed. R ·73 in.—J. MATHISON.

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SUFFOLK.

Bishop's Hill, Ipswich.—Violent TS, and the heaviest R I have ever seen; in one hour, between 4.15 and 5.15 p.m., there fell 2·95 in. In the first half hour the fall must have been at the rate of five or six inches an hour.—G. A. BIDDELL, M.I.C.E.

Clare Lodge, Ipswich.—Total R = 1·86 in.—E. R. TURNER, M.I.C.E.

Museum, Ipswich.—Total R 2·05 in.—FRANK WOOLNOUGH.

Nova Scotia House, Ipswich.—The TS began at 4 p.m. Noticing that the R was excessive, I went to my gauge (which holds about 2⅓ inches) at 4.30 p.m., expecting to find an inch or an inch and a half, but the bottle was nearly full, 2·20 in., which I poured away; at 5 p.m. I went again and measured 2·00 in.; at 6.30 p.m., when the storm was over, there was a further 0·82 in., so that there was 4·20 in. in an hour, and 5·02 in 2½ hours. There was much flooding, and some damage. I think that the centre must have been near here. One man declares that he saw a waterspout within 100 yards of this house. In another part of the town two boys and a pony were killed by the L.—G. F. GOWER.

HEREFORD.

Bodenham, Leominster.—R between noon and 2.30 p.m. 1·61 in.—H. C. STURGES.

July 24th.

PERTH.

Coupar Angus Station.—Severe TS; a house was struck by L and the chimney top demolished. R ·49 in.

GALWAY.

Queen's College, Galway.—Great TS, with 1·21 in. of R.

July 26th.

HERTS.

The Lawns, Southgate.—In less than an hour-and-a-half, 2·50 in. of R fell in a TS; the R commencing about 4.55 p.m. and lasting till about 6.20 p.m. A good sized oak tree about 3 ft. in circumference and about 40 yards from the house was struck by L and split from top to bottom, the bark being peeled completely off.—G. A. CHURCH.

SOME OLD STORMS.

1557.

"IN *Stow's Annals* is the following narration of a remarkable storm. . ." "On Sunday, 14th of August, 1557, between the hours of 9 and 10 o'clock in the forenoon, whilst the minister was

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reading the second lesson in the parish church of Blythburg,* a town in Suffolk, a strange and terrible tempest of Lightening and Thunder struck through the wall of the same church into the ground, almost a yard deep; drove down all the people on that side of the church, above 20 persons; then renting the wall up to the Revestry, left the door, and returned to the steeple, rent the timber, brake the chains, and fled towards Bungay. The people that were stricken down were found grovelling more than half an hour after, whereof a man and a boy were found dead; the others were scorched."—*Suckling's Antiquities of Suffolk.*

1741, 1745.

The Rev. Laurence Sterne was Vicar of Sutton-on-the-Forest, eight miles north of York. The following entries in the parish register are signed by him:—

1741. Hail fell in the midst of summer as big as a Pidgeon's egg. W^ch^ unusual circumstance I thought fit to attest under my hand.—L. STERNE.

1745, May. A dismal storm of hail fell upon this Town, and some other adjacent ones wh^ch^ did considerable damage to the Windows and Corn. Many of the stones measured six inches in circumference. It broke almost all the south and west Windows of this House and my Vicarage House at Stillington [2 miles further N.]—L. STERNE.

WHIRLWINDS ON JUNE 30TH AND JULY 16TH.

HAY CARRIED AWAY AT NETHER PRIORS, HALSTEAD, N. ESSEX.

TRULY Essex is a wonderful county. Mr. Joseph Last, haybinder, of Halstead, sent information to the branch office of the *Essex County Chronicle* in that town on Wednesday, June 30th, respecting a whirlwind that took place in the hayfield at Nether Priors about noon. The writer stated that a large quantity of hay was taken up into the air and carried out of sight. Twelve men who were at work in the field watched the travelling of the hay in great amazement.

The next note shows where it fell, about three miles further North.

A SHOWER OF HAY AT BELCHAMP ST. PAUL, N. ESSEX.

About eleven o'clock on Wednesday morning a curious phenomenon was witnessed in this neighbourhood. For some minutes the atmosphere was laden with falling hay. Trees, shrubs, houses, all secured a fair portion of well-made meadow hay, which came down

* A village 4½ miles S.E. of Halesworth.

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in a very fantastic manner, some quite large bunches being among the single bents. It is supposed to be the effect of a whirlwind on a distant hay field.

A SHOWER OF FROGS IN BIRMINGHAM.

During a storm that raged with considerable fury in Birmingham on Wednesday morning, June 30th, a shower of frogs fell in the suburb of Moseley. They were found scattered about several gardens. Almost white in colour, they had evidently been absorbed in a small waterspout that was driven over Birmingham by the tempest.

WHIRLWIND NEAR HEREFORD.

The haymakers in Mr. Hewitt's meadow at Hampton Park, Friday, July 16th, shortly after noon, were somewhat startled to see a number of the "cocks" suddenly collected together and carried straight up in the air. The cause of this rather unusual scene was a whirlwind. The hay was, after its ærial flight, scattered in all directions, and some fell at a distance away of quite a hundred yards.

OBJECTIONS TO MOUNTAIN OBSERVATORIES.

AN American scientific paper argues that there are many objections to mountain stations. It says that the cost of building is very large. M. Vallot's Observatory on the flanks of Mont Blanc (14,321 feet) cost £15 a cubic meter. The cost of M. Janssen's small observatory building on the summit (15,781 feet) is said to have been £12,000. Again, such establishments are very expensive to maintain. Transportation to the summit of Mont Blanc costs about two shillings per pound, for example. There are difficulties in arranging for an adequate food and water supply (though melted snow is always available on the higher peaks). In the United States (owing to the deplorable policy in the matter of forest conservation) bush fires, which fill the air with haze, are very troublesome. On the highest peaks snow blindness is a constant danger. Mountain sickness (giddiness, nausea, great discomfort, and disorder) is almost always felt. The experiments of Mr. Whymper and others, in the high Andes and elsewhere, show that long residence at high levels may enable one to resist acute attacks of mountain sickness, but no amount of habitude, apparently, can counteract the "diminished living" which results from an insufficient supply of air for breathing. Observers at extreme altitudes must always be subjected to great discomfort, and their abilities must be correspondingly decreased. De Saussure, in his expedition to Mont Blanc, remarks that he required four-and-a-half hours on the mountain to perform experiments which took less than three hours in the valley. Here we have something like a numerical measure of the falling off in ability due to great altitude.—*Manchester City News*, Aug. 7th.

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METEOROLOGY IN SCHOOLS.*

WEATHER forecasting has become a branch of study in many American schools, but especially in Boston. About 400 schools in New England now receive the daily weather maps from the U.S. Meteorological Bureau, showing the atmospheric conditions prevailing all over the country. These, as interpreted by the teachers, enable the pupils to comprehend the various factors which enter into the weather forecast. It is contended that this not only adds to an interest in natural phenomena, but is a practical introduction to scientific habits of observation. Of course, it involves instruction in the proper use of thermometers, barometers, and other instruments. Prizes for the best work in this branch of study have been offered in the New England lower schools.—*Tit-Bits*, Aug. 14th, 1897.

[Perhaps in the course of the next century even grown-up persons will have learned enough meteorology to know that it is better to get wet through in a thunderstorm, than to shelter under a tree. Even that does not seem to be generally taught yet.—ED. *M.M.*]

FLOODS IN SOUTHERN EUROPE.

DESCRIBING a perilous railway journey through the Austrian Tyrol after the rain had been falling continuously for four days, a correspondent writes:—Selecting the Innsbruck route, we reached Admont at ten in the morning, five hours late. Gangs of workmen accompanied the train, and were frequently employed removing landslips or repairing the lines, which in many places had been torn away by the raging torrent. At Admont I received the dismal news that we could proceed no further, and after waiting seven hours for instructions from headquarters, we learned that the train must return to Amstetten and proceed viâ Salzburg. All the passengers feared this retrograde journey, for the waters were still rising and the danger had manifestly increased. We had travelled a few miles only on the return road when our anticipations were realised, for a bridge, a structure of four or five arches, spanning the river and connecting a village near Hieflau, had been washed away since we had passed that morning. The scene in the corridor train itself was amusing and grotesque, for passenges of many countries and different tongues were vehemently making themselves understood by frantic gesticulations. We proceeded at a slow pace for several miles, drenched workmen walking in front of the engine, examining the permanent way. One bridge collapsed immediately our train had crossed over it. As we approached Amstetten the state of things was everywhere deplorable. Houses had been washed away and whole villages submerged. It was harvesting time, but there was no harvest. Through tracts of the most charming and fertile country, hundreds of miles in extent, the crops are entirely gone. We steamed into Amstetten Station about eight o'clock on Friday night; so, after twenty-three hours' anxious travel, we had actually accomplished a distance ordinarily covered in two or three hours from Vienna. Bridges had collapsed on the Salzburg and Munich route. The Linz

* See *Met. Mag.*, xxxi., p. 151.

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line was flooded and in places washed away. Communication with Vienna was cut off, a railway bridge, with a passenger train, having fallen into the river at St. Polten. So Amstetten had become a veritable place of refuge. Several trains by various routes had returned to this village of some 2,000 or 3,000 inhabitants. For a dismal picture I can recall nothing to equal the sights at this station. Outside it was still raining in torrents. The hotels were full to their utmost capacity. Hundreds of weary and disappointed passengers, of all nationalities, and many families with children, could get no accommodation. Fortunately, a Continental station, with its café and restaurant, is better equipped to deal with such an emergency than would be the case at a wayside station in England. Several benevolent residents did yeoman service in finding rooms and beds for the stranded travellers. Amstetten is a very hospitable place, and it is pleasant to record that this band of gentlemen, to their own credit and to the honour of their town, rendered such acceptable assistance. By far the larger number of wayfarers found shelter for the night in the railway carriages, which the company placed at their disposal. Telegraphic communication was interrupted, and the following day (Saturday) railway traffic was suspended. Newspapers were not obtainable. The only news had its source in the local telephone office. Vienna itself was reported in danger, for the Danube in the preceding twenty-four hours had risen 12 ft. and was still rising. Such a mighty flood had it become that two miles from the bed of the river people were on the roofs of their dwellings, appealing for help, and the fortunate ones being rescued in boats. What I have witnessed along the course of one tributary of the Danube, was taking place in every valley in the Austrian Tyrol, and in Saxony and Bohemia the Elbe and its tributaries were making similar havoc.—*Daily Telegraph*, August 11th.

With reference to the above we hope to give some statistics in our next number, for we hear from Dr. Hellmann that he is preparing an account of the tremendous rainfall in Silesia, Saxony, Bohemia, &c., at the end of July. Some of the stations seem to have had about *twelve inches in four days.*

The only station in the neighbourhood of which particulars are given in the *Daily Weather Report* is Munich, where the mean annual rainfall is about 35 inches; the daily fall reported thence was—

	July 26th.	27th.	28th.	29th.	30th.	Total.
	in.	in.	in.	in.	in.	in.
Amount.....	0·35	1·22	0·47	0·75	1·42	4·21

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REVIEWS.

The Story of the Earth's Atmosphere. By DOUGLAS ARCHIBALD, M.A., F.R.Met.Soc. London, 1897. Sm. 8vo.

ALTHOUGH the publishers (George Newnes, Limited) have not done us the honour of recognising our existence by sending us a copy of this work for review, we present them with one, because we think that our readers ought to know of this little book, which is very much better than either its title or its appearance suggests.

The author is one of the few who, while capable as mathematicians, will condescend, *and are able*, to convey to ordinary mortals the results arrived at by high class research. To all who wish to know the latest opinions as to why various atmospheric phenomena occur we strongly recommend this little book. In one respect it is, we think, unique—there are 208 pages by Douglas Archibald, and we have not seen a single mathematical expression; we do not think that there is even a + or a − in the whole book.

We have noticed very few slips; on page 38 probably Mr. Archibald is referring to something unknown to us, otherwise we think that "actinometer" should be "bolometer," and "Washington" should be "Mount Whitney." On page 134 he gives a new spelling of "Chirapunji;" it used to be Cherra Poongee; in 1864 Keith Johnston, in *Index Geographicus*, gave Chirra Punji *or* Chirra Poonjee; then in 1882 Mr. J. Eliot spelled it Cherrapunji; in 1890 Mr. Blanford gave Cherra Poonjee.

Illustrative Cloud Forms for the guidance of observers in the classification of clouds. Issued by the Hydrographic Office, Washington, U.S.A.; oblong, text 7 in. × 4 in., 16 coloured plates, 1897.

WE are not sure that it is desirable that there should be several cloud atlases in existence concurrently; but, probably, administrative difficulties would be raised if in any country copies of the *International Cloud Atlas* were purchased sufficient in number to supply an entire navy. This, probably, is the reason for the appearance of the present artistic little volume.

The Hydrographer (Captain Sigsbee, U.S.N.) in an introductory note points out that the classification, nomenclature and descriptive text are from the *International Cloud Atlas*, but everything else is American. The excellent colour lithography has been done by Messrs. L. Prang and Co. of Boston, and their representative worked in consultation with Mr. Cronan, who painted the cloud pictures which have been reproduced. Mr. Cronan had the further advantage of working from the I.C.A., from a collection of photos and other representations, and with the advice of Mr. Lawrence Rotch, Capt. Sigsbee and Mr. H. H. Clayton.

The result is a very handy little book, which satisfactorily meets its presumed object; some of the plates (vii., x., xi. and xiii.) are

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excellent We do not say that iii. is incorrect, but it seems to us to have too much of the horizontal element in it, and we think that Mr. Cronan has not, in the mammato-cumulus, xiv., quite caught the idea of weight nearly breaking through a textile material (say, sand breaking through sacking) which is the characteristic of a perfect specimen of this cloud. Fig. 26 in the *International Cloud Atlas* is better in that respect, but it indicates rather too much separation—independence—between each mamma. Notwithstanding the extreme roughness of its execution, we think that the little woodcut in Dr. Clouston's *Explanation of the Popular Weather Prognostics of Scotland*, 1867, is more truthful and suggestive than either of its more costly successors.

THE INDEX TO THE "METEOROLOGICAL MAGAZINE."

We see that it was in our number for March, 1896, that we promised to compile the above; but it was a heavy task, and it was only in July, 1897, that it was finished and the copies were completed, bound and sent to the subscribers.

As we anticipated, the subscription price of 2s. 6d. proved far too little; but as Mr. C. L. Brook (whose letter will be found on p. 24 of our last volume) has sent the very handsome contribution of £10 towards the cost, and, as we hope that a reasonable number of copies will be sold at the full price of 5s., we do not think that there will be any serious loss.

As stated in the Preface, we are greatly indebted to the Rev. T. A. Preston for his help; and, though the Index like most human things is not absolutely perfect, we are glad to hear from many quarters satisfactory assurances of its utility.

ERRATA IN "METEOROLOGICAL MAGAZINE," 1896.

Regular Tables.

Waringstown	February.	Total	rain	*should be*	1·46	in.	*not*	1·26	in.
Cargen [Dumfries].....	March.	,,	,,	,,	,,	4·65	,,	,,	4·56	,,
Stroud, Upfield	April.	,,	,,	,,	,,	1·06	,,	,,	1·11	,,
Omagh, Edenfel.....	,,	,,	,,	,,	,,	2·42	,,	,,	2·52	,,

Supplementary Tables.

Rendlesham Hall	January.	Total	rain	*should be*	1·30	in.	*not*	1·24	in.
Northampton, Sedgebrook	March.	,,	,,	,,	,,	2·79	,,	,,	2·70	,,
Colchester, Lexden.....	,,	,,	,,	,,	,,	2·80	,,	,,	2·77	,,
Lough Swilly, Carrablagh	April.	,,	,,	,,	,,	2·93	,,	,,	2·87	,,
Killybegs	August.	,,	,,	,,	,,	4·32	,,	,,	4·27	,,
Lilliesleaf, Riddell	November.	,,	,,	,,	,,	1·04	,,	,,	1·14	,,

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, FEBRUARY, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	TotalRain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	58·0	26	27·9	8	48·4	39·0	39·7	86	93·3	22·6	2·75	14	8·2
Malta	63·0	22*a*	43·2	19	60·8	50·8	48·5	75	136·5	...	·49	4	5·5
Mauritius	86·3	15	71·0	24	83·9	75·0	70·7	77	135·4	64·0	3·14	19	7·2
Calcutta	91·6	25	53·2	19	82·6	63·8	58·2	63	144·5	43·8	1·59	3	3·0
Bombay	83·6	17	63·3	28	81·4	68·1	63·8	69	131·5	51·8	·00	0	0·8
Ceylon, Colombo	90·4	13	70·8	5	88·6	75·0	72·3	78	146·0	68·8	1·68	11	4·7
Melbourne	95·6	18	48·9	22	74·3	57·3	55·3	72	143·0	39·5	2·97	13	6·0
Adelaide	107·3	10	52·9	26	86·3	64·5	53·7	48	163·9	42·5	1·80	8	5·1
Sydney	90·5	24	61·8	25	77·9	64·8	57·7	60	150·3	53·2	·46	7	3·7
Wellington	76·0	21	45·5	6	68·9	55·9	53·9	74	141·0	37·0	5·02	16	4·9
Auckland	82·0	2, 17	56·0	6	75·4	62·3	61·1	76	145·0	54·0	5·38	15	5·2
Jamaica, Kingston	92·3	26	65·8	14*b*	87·5	68·9	65·7	66	...	...	·00	0	2·5
Trinidad	90·0	5, 11	64·0	3, 4*b*	87·3	67·6	68·4	76	171·0	62·0	·75	11	...
Grenada	86·0	2	69·8	28	83·5	72·3	66·2	64	152·0	...	2·03	12	1·7
Toronto	44·0	17	1·0	26	30·8	18·2	21·2	81	58·2	—3·3	2·34	12	7·4
New Brunswick, Fredericton	42·9	7	—18·4	28	29·0	4·3	9·7	66	...	...	1·53	7	4·3
Manitoba, Winnipeg	32·2	4	—41·0	25	13·3	—11·4	...	...	...	...	·89	6	4·5
British Columbia, Esquimalt	50·6	26	28·2	21	45·4	35·5	37·3	89	...	...	3·63	19	8·1

a—and 23. *b*—and 15.

Remarks.

Malta.—Adopted mean temp. 55°·3, or 1°·5 above the average. Mean hourly velocity of wind 12·8 miles. TS on 9th. Mean temp. of sea 59°·1. J. F. Dobson.

Mauritius.—Mean temp. of air 0°·6 above, of dew point 0°·7 above, and rainfall 3·84 in. below, their respective averages. Mean hourly velocity of wind 16·1 miles, or 4·6 above the average; extremes 29·3 on 22nd and 2·8 on 20th; prevailing direction E. by S. The driest February since 1876, excepting 1885, 2·16 in.; 1893, 2·42 in.; and 1895, 2·97 in. T and L on 20th. L on 27th. T. F. Claxton.

Adelaide.—Mean temp. 1°·7 above the average of 40 years; a very hot spell occurring from the 7th to the 18th, the temp. rising above 100° in the shade on 5 days, and over 90° on 10 consecutive days. C. Todd, F.R.S.

Sydney.—Mean temp. 0°·5 above, rainfall 4·91 in. below, and humidity 15 below, their respective averages. H. C. Russell, F.R.S.

Wellington.—Fine in the early part, with a few light showers; from 9th to 16th wet, the max. rainfall (1·50 in.) being recorded on 13th; from 16th to 22nd, fine with moderate winds, chiefly northerly; remainder of the month showery and dull. Temp. 0°·1 below, and R 1·48 in. above, their respective averages. Slight double earthquake, shock at 9.4 p.m. on 27th. R. B. Gore.

Auckland.—A wet and disagreeable month, the rainfall being nearly two inches above the average. Heavy gale from N.E. on 11th and 12th, and again on 27th and 28th. T. F. Cheeseman.

Trinidad.—Rainfall ·94 in. below the average of 30 years. J. H. Hart.

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SUPPLEMENTARY TABLE OF RAINFALL, JULY, 1897.

[For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	·61	XI.	Rhayader, Nantgwillt ...	3·15
II.	Dorking, Abinger Hall .	1·88	,,	Lake Vyrnwy	...
,,	Birchington, Thor	·51	,,	Corwen, Rhug	1·30
,,	Hailsham	·38	,,	Criccieth, Talarvor	1·51
,,	Ryde, Thornbrough	·75	,,	I. of Man, Douglas	1·56
,,	Emsworth, Redlands ...	·57	XII.	Stoneykirk, Ardwell Ho.	1·73
,,	Alton, Ashdell	·87	,,	New Galloway, Glenlee	2·46
III.	Oxford, Magdalen Col..	1·76	,,	Moniavie, Maxwelton Ho.	2·15
,,	Banbury, Bloxham	·52	,,	Lilliesleaf, Riddell	2·47
,,	Northampton, Sedgebrook	·30	XIII.	N. Esk Res. [Penicuick]	2·65
,,	Duddington [Stamford].	·13	XIV.	Glasgow, Queen's Park..	2·22
,,	Alconbury	·08	XV.	Inverary, Newtown	6·76
,,	Wisbech, Bank House...	·60	,,	Oban, The Corran	5·11
IV.	Southend	·82	,,	Islay, Gruinart School ...	1·00
,,	Harlow, Sheering..... ...	·75	XVI.	Dollar.....	1·73
,,	Colchester, Lexden	·47	,,	Balquhidder, Stronvar...	3·71
,,	Rendlesham Hall	·63	,,	Ballinluig	1·06
,,	Rushall Vicarage	1·22	,,	Dalnaspidal H.R.S.....	2·98
,,	Swaffham	·71	XVII.	Keith H.R.S.....	1·82
V.	Salisbury, Alderbury ...	·72	,,	Forres H.R.S.	·72
,,	Bishop's Cannings	1·30	XVIII.	Fearn, Lower Pitkerrie..	·55
,,	Blandford, Whatcombe .	·39	,,	N. Uist, Loch Maddy ...	3·69
,,	Ashburton, Holne Vic...	1·44	,,	Invergarry.....	1·24
,,	Okehampton, Oaklands.	1·89	,,	Aviemore H.R.S.	1·38
,,	Hartland Abbey	2·49	,,	Loch Ness, Drumnadrochit	2·22
,,	Lynmouth, Glenthorne.	1·82	XIX.	Invershin	1·83
,,	Probus, Lamellyn	2·38	,,	Scourie	...
,,	Wellington, The Avenue	1·33	,,	Watten H.R.S.....	1·51
,,	Wincanton.....	·69	XX.	Dunmanway, Coolkelure	2·58
VI.	Clifton, Pembroke Road	1·83	,,	Cork, Wellesley Terrace	1·19
,,	Ross, The Graig	...	,,	Killarney, Woodlawn ...	2·26
,,	Wem, Clive Vicarage ...	·61	,,	Caher, Dunaske	1·33
,,	Cheadle, The Heath Ho.	·95	,,	Ballingarry, Hazelfort...	2·51
,,	Worcester, Diglis Lock	·54	,,	Limerick, Kilcornan ...	2·02
,,	Coventry, Priory Row ..	·25	,,	Broadford, Hurdlestown	3·39
VII.	Grantham, Stainby	·38	,,	Miltown Malbay	...
,,	Horncastle, Bucknall ...	1·26	XXI.	Gorey, Courtown House	1·69
,,	Worksop, Hodsck Priory	·57	,,	Athlone, Twyford	3·23
VIII.	Neston, Hinderton	·78	,,	Mullingar, Belvedere ...	2·57
,,	Southport, Hesketh Park	1·27	,,	Longford, Currygrane...	2·85
,,	Broughton-in-Furness ...	2·56	XXII.	Woodlawn	2·46
IX.	Ripon, Mickley.....	1·03	,,	Crossmolina, Enniscoe ..	3·73
,,	Melmerby, Baldersby ...	1·29	,,	Collooney, Markree Obs.	3·67
,,	Scarborough, Observat'y	·58	,,	Ballinamore, Lawderdale	3·34
,,	Middleton, Mickleton ...	1·55	XXIII.	Warrenpoint.....	1·67
X.	Haltwhistle, Unthank...	1·91	,,	Seaforde.....	1·33
,,	Bamburgh	2·05	,,	Belfast, Springfield	2·34
,,	Keswick, The Bank.....	2·49	,,	Bushmills, Dundarave..	2·33
XI.	Llanfrechfa Grange	2·21	,,	Stewartstown	2·49
,,	Llandovery	2·29	,,	Killybegs	4·52
,,	Castle Malgwyn	2·29	,,	Lough Swilly, Carrablagh	2·82
,,	Builth, Abergwesyn Vic.	3·33			

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JULY, 1897.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date	No. of Night below 32°. In shade.	On grass.
		inches.	inches.	in.								
I.	London (Camden Square) ...	·64	— 2·04	·38	19	8	83·6	24	44·0	8	0	0
II.	Tenterden ...	·75	— 1·60	·42	19	7	81·0	17	44·0	8	0	...
,,	Strathfieldsaye ...	1·67	...	·56	26	4	...	...	...	...	...	...
III.	Hitchin ...	·80	— 1·92	·60	20	4	81·0	24*a*	40·0	7	0	...
,,	Winslow (Addington) ...	1·53	— 1·76	·73	21	6	81·0	30	38·0	8	0	0
IV.	Bury St. Edmunds (Westley)	·73	— 1·84	·54	20	4	76·0	24	47·0	8	0	...
,,	Norwich (Brundall) ...	·67	...	·21	24	7	85·0	24	42·1	8	0	0
V.	Weymouth(LangtonHerring)	·41	— 1·74	·18	19	7	78·0	31	46·0	8	0	...
,,	Torquay (Cary Green)	·88	...	·33	19	6	78·7	16	46·0	8	0	0
,,	Polapit Tamar [Launceston]..	3·68	+ ·27	1·77	20	12	...	...	...	...	...	...
VI.	Stroud (Upfield) ...	2·91	— ·66	2·00	20	10	83·0	16*b*	50·0	4	0	...
,,	ChurchStretton(Woolstaston)	·99	— 1·98	·45	25	8	80·5	16	44·5	7	0	...
,,	Tenbury (Orleton) ...	1·50	— 1·36	·50	19	10	86·5	16	37·7	8	0	1
VII.	Leicester (Rotherby Hall) ...	·42	...	·13	25	6	80·0	23*c*	35·0	8	0	1
,,	Boston ...	1·78	— 1·01	·67	26	7	82·0	30	40·0	8	0	...
,,	Hesley Hall [Tickhill]...	·52	— 2·15	·12	1	7	81·0	18*d*	40·0	11*e*	0	...
VIII.	Manchester(PlymouthGrove)	1·73	— 2·06	·60	26	12	83·0	18	45·0	6*f*	0	...
IX.	Wetherby (Ribston Hall) ...	·46	— 2·72	·19	25	7	...	...	...	...	...	...
,,	Skipton (Arncliffe) ...	2·74	— 2·90	·62	7	13	...	...	...	...	...	...
,,	Hull (Pearson Park).	·40	— 2·19	·22	25	7	80·0	23	40·0	11	0	...
X.	Newcastle (Town Moor) ...	1·39	— 2·13	·88	20	10	...	...	...	...	...	...
,,	Borrowdale (Seathwaite)...	7·88	— 3·11	2·57	8	14	...	...	...	...	...	...
XI.	Cardiff (Ely)... ...	1·41	— 2·65	·54	19	11	...	...	...	...	...	...
,,	Haverfordwest	3·00	— 1·21	·83	19	14	81·0	16	41·0	8	0	0
,,	Aberystwith (Gogerddan) ...	2·88	...	1·15	18	11	84·0	15	37·0	10	0	...
,,	Llandudno...	·87	— 2·13	·21	8	7	76·5	31	47·6	11	0	...
XII.	Cargen [Dumfries]	1·60	— 2·33	·36	20	9	81·6	15	40·6	11	0	0
XIII.	Edinburgh (Blacket Place)...	1·82	...	·71	20	10	81·0	15	43·3	8	0	...
XIV.	Colmonell ...	1·89	...	·40	8	10	80·0	31	35·0	10	0	...
XV.	Lochgilphead (Kilmory).....	3·61	— ·69	·58	28	14	...	...	39·0	10	0	...
,,	Mull (Quinish) ...	4·99	+ ·94	1·04	23	14	...	...	...	...	...	...
XVI.	Loch Leven Sluices ...	1·80	— 1·82	·30	9	10	...	...	...	...	...	...
,,	Dundee (Eastern Necropolis)	2·25	— 1·21	1·60	24	10	82·1	15	41·9	8	0	...
XVII.	Braemar	1·76	— 1·45	·95	24	13	77·7	15	35·4	11	0	3
,,	Aberdeen (Cranford)	1·74	...	·83	24	14	74·0	23*d*	35·0	7	0	...
,,	Cawdor (Budgate) ...	1·04	— 2·26	·18	6, 27	13	...	...	...	...	...	...
XVIII	Strathconan [Beauly] ...	4·30	+ ·80	1·54	5	11	...	...	...	...	...	...
,,	Glencarron Lodge...	7·55	...	1·47	6	16	79·9	15	39·6	11	0	...
XIX.	Dunrobin ...	1·03	— 1·82	·28	25	9	77·8	15	41·0	8	0	...
,,	S. Ronaldsay (Roeberry).....	1·58	— ·78	·42	5	13	74·0	24	44·0	6, 7	0	...
XX.	Darrynane Abbey...	1·88	...	·42	24	18	...	...	...	...	...	...
,,	Waterford (Brook Lodge) ...	1·97	— 1·56	·82	19	16	77·0	16	39·5	8	0	...
,,	O'Briensbridge (Ross)	3·39	...	·57	23	14	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	1·53	— 1·99	·39	19	12	...	...	...	...	...	...
,,	Dublin (FitzWilliam Square)	1·65	— 1·03	·29	26	12	75·1	23	46·1	11	0	0
XXII.	Ballinasloe	2·47	— 1·08	·50	23	16	75·0	31	45·0	7	0	...
,,	Clifden (Kylemore)	4·77	...	1·34	26	16	...	...	...	...	...	...
XXIII	Waringstown ...	1·37	— 2·15	·55	24	9	85·0	16	42·0	12	0	0
,,	Londonderry (Creggan Res.).	2·19	— 1·93	·44	24	15	...	...	...	...	...	...
,,	Omagh (Edenfel) ...	3·59	— ·13	1·70	24	14	80·0	15	43·0	7	0	...

ENGLAND. WALES. SCOTLAND. IRELAND.

+Shows that the fall was above the average ; —that it was below it.

a—and 30. *b*—and 18. *c*—and 24, 30. *d*—and 24. *e*—and 12. *f*—and 7, 10.

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METEOROLOGICAL NOTES ON JULY, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm: R for Rain; H for Hail S for Snow.

ENGLAND.

TENTERDEN.—A dry, hot month, grass very much burnt up, flowers and fruit also felt the effect of east winds and scorching sun, only on one day was the temp. in shade above 80°, against five in 1896. Duration of sunshine almost exactly the same, 249 hours. Other gauges in the district received much less R in the TS of 19th. Sharp TS on 21st. Slight TS on 27th. Fog on 17th and 23rd.

ADDINGTON.—A very fine month, grand weather for haymaking. From 28th June until 19th July, only one little shower fell. The storms on the 20th and 21st were very local. On the 20th, four miles S.E., hay was being carried all the time it rained here, and five miles W. there was just a sprinkling. The TS of the 21st was very sharp. In an adjoining parish some workmen had a narrow escape, a cow being killed under a tree a few yards from where they were standing; a sheep was also killed in Claydon parish. The night of the 8th was cold for July, the thermometer on the grass falling to 35°.

BURY ST. EDMUNDS, WESTLEY.—A very dry, hot month, with much sunshine. Wheat cutting began on the 26th. Barley much injured by want of rain. Heavy TS on 20th. TS on 21st; distant T on 22nd.

NORWICH, BRUNDALL.—Mean temp. 0°·8 lower than the previous July, and rainfall 2·22 in. below the average. T and L on 20th and 26th. T on 21st.

WEYMOUTH, LANGTON HERRING.—With the exception of July, 1885, when only ·25 in. of R fell, the driest July in 23 years. The mean temp at 9 a.m., 64°·8, is 2° above the average. The mean max., 71°·7, has been exceeded only once in 26 years, in 1878, when it was 72°·6. A very fine month; oats carried under favourable conditions. T on the 18th; fog on the 23rd.

TORQUAY, CARY GREEN.—Rainfall 1·85 in. below the average. Mean temp. 63°·0 or 1°·7 above the average. Duration of sunshine 246 hours 25 minutes, being 56 hours 25 minutes above the average; one sunless day.

POLAPIT TAMAR [LAUNCESTON].—A severe TS, with frequent vivid L, heavy T, and torrents of R shortly before 1 p.m. on the 20th. After 45 minutes ·84 in. was measured, and in all probability ·80 in. fell in 30 minutes. In 2 hours 20 minutes 1·29 in. had fallen, and at 8.30 p.m., or in 7 hrs. 30 min., a total of 1·62 in. was registered.

STROUD, UPFIELD—TSS on 20th, 25th and 26th.

WOOLSTASTON.—Very hot and very dry, little R till the 24th and 25th, when there were repeated short violent storms. Mean temp. 61°·5.

TENBURY, ORLETON.—A very fine, hot month, with a large percentage of bright sunshine. The temp. rose above 70° on 21 days, and above 80° on 6 days. Very little T was heard, and no L seen during the month.

ROTHERBY HALL.—Though July was generally hot and dry, the rainfall here is still 1·60 in. in excess of that for the first seven months of 1896. On the 8th the thermometer on the grass fell to 32°, which is the lowest on record here for July. The mean shade temp. was 59°. T on 21st, 25th, and 26th.

BOSTON.—On the 21st a heavy thundershower occurred, the R being partial. In the town 1·36 in. was registered, others recorded 1·26 and 1·80, and at the Witham Grand Sluice 2·17 in. At Kirton, 4 miles away, no rain fell.

MANCHESTER, PLYMOUTH GROVE.—Unsettled up to the 9th, then fine, summer weather, from 10th to 22nd, and on 30th and 31st. T and L on 5th, TS on 25th. Mean temp. 61°·5.

SKIPTON, ARNCLIFFE.—A dry month.

WALES.

HAVERFORDWEST.—The magnificent weather of June was prolonged, with the exception of small falls of R on 6th and 7th, up to the 18th, and one of the

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finest hay harvests known for many years was saved in grand weather. A sudden change took place on the 18th, and R came just in time to save green crops from the devastation of the fly, and the crops generally from failure owing to excessive high temp. and drought. Max. in sun, 132°·8 on 16th. Fruit crops a total failure. Prevailing wind S.S.E., N.N.W. and S.E. The night temperatures were unusually high. On 19th and 20th, 1·66 in. of R fell in 36 hours.

ABERYSTWITH, GOGERDDAN.—A very hot, dry month, with a few TSS.

SCOTLAND.

CARGEN [DUMFRIES].—The climatic conditions of the month were the most favourable experienced for many years. Temp. and sunshine approximate very closely to the returns for the Jubilee year 1887, the mean temp. during the month (60°·3) of that year being 0°·4 higher than that just recorded; no higher mean temp. for July has been recorded during the intervening years. It is worthy of remark, that in the "seventies" the mean temp. of this month exceeded 60° five times; in the "eighties" only once; while in the "nineties," so far, that figure has not yet been reached. The hours of sunshine are two more than recorded in 1887, and have only once (in 1878) been exceeded during the last 38 years. The rainfall for the month is the least recorded since 1878, and is about one-half of the average. Light easterly winds have been most prevalent. The weather was exceptionally favourable for farm work. Rye grass hay was secured in splendid condition, and good progress was made with an unusually heavy crop of meadow hay. Harvest will be about three weeks later than last year, and will not be general before the latter end of August; an abundant yield of both grain and straw is anticipated. T on 24th and 27th.

EDINBURGH, BLACKET PLACE.—The feature of the month was the very large amount of bright sunshine, 232 hours being recorded. Fog at night on 13th, TSS on 24th, and T on 25th.

COLMONELL.—R 1·74 in. less than, and mean temp. 2°·1 above, the average of 21 years.

BRAEMAR.—An excellent, forward, growing month.

ABERDEEN, CRANFORD.—A heavy TS on the 24th.

S. RONALDSAY, ROEBERRY.—A fine month upon the whole, with the exception of two cold snaps. Mean temp. 55°·7, or 1°·1 above the average of seven years. A slight TS on morning of 25th.

IRELAND.

DARRYNANE ABBEY.—A foggy, misty month, very warm at the end. T between midnight and 1 a.m. on 24th.

WATERFORD, BROOK LODGE.—Broken weather, with spells of east wind and a good deal of fog at night. Heavy T on 20th.

O'BRIENSBRIDGE, ROSS.—Bright from 8th to 16th; close and sultry without sunshine for most part of the latter half. The last two days very warm.

DUBLIN, FITZ WILLIAM SQUARE.—A very favourable month, with sufficient R and of average temp. Mean temp. 61°·1, or 0°·5 above the average. Temp. reached or exceeded 70° in the screen on 7 days. In July, 1887, the temp. reached or exceeded 70° in the screen on no fewer than 17 days; while in 1888, the maximum for July was only 68°·7. TS on the evening of the 21st. Solar halo on the 4th. H on the 6th and 26th. Foggy on the 16th, 21st and 31st.

WARINGSTOWN.—Splendid weather all the month; the best hay harvest remembered; all crops good.

EDENFEL.—After the abnormal and persistent R and unsettled weather of June, July has been somewhat in the nature of a pleasant surprise. After the first week a complete—and what has turned out a permanent—change for the better took place, and with considerable sunshine, warmth and but occasional torrential showers, all crops now afford the promise of great abundance.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXX.] SEPTEMBER, 1897. [PRICE FOURPENCE. or 5s. per ann. post free.

The Hon. Ralph Abercromby,

1842–1897.

WE should have mentioned in an earlier number the loss which meteorology sustained by the death in Sydney, N.S.W., of Mr. Abercromby, but that the first news came only by telegraph, and we clung to the hope that it might not be true; but unhappily it is, and we shall no more hear the calm, clear voice, always gentle, always instructive.

It is impossible within ordinary limits to enumerate the works and papers issued by Mr. Abercromby between 1874 and 1894—there must be 50 or 60. Some of the important ones, "Weather," "Seas and Skies in many Latitudes," "Instructions for observing Clouds," and "Principles of Forecasting by means of Weather Charts," have been noticed in these pages. Had his physique been equal to his brain power, Abercromby would have taken quite an exceptional position, for, in spite of ill-health, he was a leader who turned out much, and valuable, work. Even when too ill to write himself, Mr. Abercromby manifested his lifelong interest in meteorology by offering prizes for meteorological essays, and by freely distributing copies of the papers which he enabled others to write.

Although he died in Australia, far from his relatives, it is a comfort to think that while fading away, he had the sympathy and care of a brother meteorologist, Mr. H. C. Russell, F.R.S., of Sydney Observatory.

FROMONDUS.

To the Editor of the Meteorological Magazine.

SIR,—I am obliged by your notice in the *Meteorological Magazine* of the article upon Fromondus, by M. l'Abbé Monchamp, which appeared recently in *Ciel et Terre*.

There is one passage in the article which you have not correctly translated. You say "Prof. Monchamp regards the record of the weather kept by Froidmont in 1614 and 1625 as 'the earliest kept

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in Belgium if not in the world.'" If M. Monchamp had used those words, I certainly should not have allowed them to appear, for every one familiar with meteorological work knows of Tyge Brahe's *Meteorologiske Dagbog* and of *Merle's MS.* M. Monchamp wrote, "Trouverait on *beaucoup de* séries d'observations météorologiques antérieures à cette époque, même faites sans le secours d'instruments?" This is very different from what you printed in the *Meteorological Magazine*, and far from suggesting that the author considered Froidmont's observations as the oldest known. (1)

With respect to the remark concerning the zodiacal light, it seems to me more plausible than to attribute the phenomenon to a bolide. But we must not forget that in ancient times exaggeration was frequent. (2)

I can add to your list of editions of Fromondus one more—Anvers, 1634—on the authority of the *Biographie Nationale*, published by the *Académie des Sciences.* (3)

Yours very truly,

A. LANCASTER.

Observatoire Royal de Belgique.

[No one likes to have made a mistake, but we really think that it was fortunate that we did, because it has elicited M. Lancaster's letter and will perhaps bear further fruit. We have added numerals to the paragraphs of M. Lancaster's letter, and employ the same in the following comments:—

(1) Our fault; we overlooked the words which we have now printed in italics, "*beaucoup de.*" While upon this subject, we think it well to inquire, whether it would not be desirable to compile a list of journals of the weather prior to 1650, after which date they became common.

(2) We cannot accept the idea of a zodiacal light strong enough to dim the midnight brightness of the moon. Our readers have now M. Lancaster's opinion and our own, and there we must leave the matter. The passage in the original is—"Et à fido teste nuper audivi, autumno anni 1625, ingentem trabis molem, intempestâ nocte, ab Occasu exortam, paullatimque ad cæli culmen evectam, Lunam clarissimè splendentem infuscasse."

(3) We are very glad to add to the list of editions that mentioned by M. Lancaster. We had consulted his very valuable *Catalogue des ouvrages d'Astronomie, &c.*, but it is not mentioned there; perhaps there is now no copy in existence.

Mr. Prince, of Crowborough, has a copy of edition E, and points out that according to the signatures it is a 4to, and that therefore the entry under F is superfluous. We object to a page 5·4 in. by 3·2 in. being called a 4to; but as it is evident from the signatures that

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it was printed in 8's, we suppose that the paper was *half sheets*. However that may have been, this is a capital illustration of the muddle as to sizes of which we complained on p. 102, and it could not have been cleared up had not Mr. Prince sent us the precise space on each page occupied by type.—ED.]

BUYS-BALLOT.

WE do not often reprint what we have written, but it is seven years since the following note appeared, and we think that no stronger appeal could be made than by this brief narrative of facts.

Buys-Ballot.

One by one, with saddening frequency, those whose names are known to Meteorologists of all countries are leaving us. On Sunday night, February 2nd, 1890, from his well-loved home at Utrecht, passed away the spirit which gave to the world the useful "Buys-Ballot's Law," by which the author will be remembered long after his many personal friends have themselves been removed. Prof. Buys-Ballot was often in this country; he was a corresponding member of the British Association, and attended its meetings, and he was one of the nineteen honorary members of the Royal Meteorological Society. He was 72 years of age, was an honorary member of the Society of Arts, of the German and of the Austrian Meteorological Societies, and Knight or Commander of Orders in Austria, Netherlands, Portugal and Prussia.

Besides discharging the duties of his Professorship from 1847 to 1887, Dr. Ballot was director, indeed almost creator, of the Royal Meteorological Institute of the Netherlands. In 1883 a new island, discovered by the Dutch Meteorological Expedition, in 70° 25′ 28″ N., was named after him as Buys-Ballot's Island, and in 1887, on giving up his professorial duties, a sort of International banquet was given in his honour, and he was presented with a gold medal specially struck to commemorate the event. Dr. Ballot's earliest scientific papers were upon chemistry and physics, but for forty years nearly all his time and thought has been devoted to meteorology, and his contributions have appeared not only in Dutch, but in German, French, and English.

The old buildings in which Buys-Ballot worked for 40 years have had to be pulled down. A new Royal Dutch Meteorological Institute has been erected at De Bilt, near Utrecht, and his countrymen, successors and co-labourers desire to place at it a monumental bust to his memory. Nearly all the leading meteorologists in both hemispheres have formed an international committee to co-operate with Buys-Ballot's own countrymen in raising the necessary funds, and we gladly comply with their request to lay the matter before our readers, and shall be happy to acknowledge and forward any donations which any of them may feel inclined to send. Our own personal view of the matter is that no very large sum is required, but that the greater the number of contributors, the more would it be evidence of the esteem in which the deceased was held.

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CLIMATOLOGICAL RECORDS FOR THE BRITISH EMPIRE IN 1896.

IT will, perhaps, be conducive to the convenience of our readers if we arrange our remarks on the annual summary of our monthly climatological tables under the various headings as set out, while it will not make them much more fragmentary than would be the case under any other arrangement.

Max. shade temp. Adelaide, as is the case in about three years out of four, recorded the highest shade temp., but the reading, though above the average, is not remarkable. The value of 104°·8 at Malta appears to be unprecedented; the temp. having risen above 100° in only six out of thirteen years. At Calcutta, 1896 was apparently remarkably warm, as the mean temp. and the mean max. are the highest from 1877 onwards, while the absolute max. (106°·8) was exceeded only in 1895. On the other hand, the absolute min. (45°·5) is the lowest in any year of the same period.

Min. shade temp. and mean min. Greatest total range and greatest daily range. No other station has ever approached Winnipeg in these elements, but the 1896 values are normal, and call for no special comment.

Least total range and least daily range. Grenada, which records these two extremes, has only recently been added to the tables, but the values appear to be normal, and are very similar to those which in former years were obtained at Barbados.

Highest mean temp. Ceylon has every year yielded the highest mean temp., though the average of fifteen years at Bombay is less than a degree lower. The 1896 record of 81°·5 has been exceeded only twice in seventeen years, namely, by 81°·9 in 1878, and 81°·7 in 1895.

Driest and dampest stations. Adelaide has for many years recorded the lowest relative humidity, and Esquimalt, since its inclusion in the tables in 1891, the opposite extreme. The 1896 records, 59 and 87 respectively, are not remarkable.

Max. in sun and min. on grass. These records are, perhaps, so much dependent on the instruments and their exposure, as to be incapable of strict comparison, but Trinidad always yields very high values. In the absence of a grass minimum at Winnipeg, Toronto has always given the lowest radiation temp.

Greatest and least rainfall. The variation in the amounts of rainfall at the stations included in our tables has always been less than the variation between different parts of England in an ordinary year, and the 1896 extremes are not unprecedented, though the Adelaide total (15·17 in.) is much below the average. The Mauritius fall of 68·17 in. is the greatest in any year from 1877 onwards, that, with a total of 60·36 in., being the only other year with more than 60 inches. Curiously, the number of rainy days is the smallest, with two exceptions, in the same period.

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Most and least cloud. Esquimalt has for some years recorded the greatest amount of cloud, but does not show a great excess over London. Grenada, apparently, rivals Malta in the clearness of its skies, though some years back the latter station gave a yearly mean of 2·9. The average for the five years, 1884-88, is 3·4, while for the five years 1892-96, the average is 4·5. Is it possible that there has been a change of observer and also of personal equation?

We received some time since from a gentleman (whose name we could not read, and therefore to whom we could not reply) a criticism of a reprint of one of these articles. The reprint implied that we stated some temperature to be the highest in the world (!) Of course, it is obvious that the extremes refer only to the 18 stations enumerated on p. 122.

SUMMARY.

Highest temp. in shade	111°·2 at Adelaide on January 23rd.
Lowest „ „	−45°·2 at Winnipeg on January 4th.
Greatest range in year	135°·7 at Winnipeg.
Least „ „	21°·2 at Grenada.
Greatest mean daily range ...	22°·5 at Winnipeg.
Least „ „ „ ...	9°·3 at Grenada.
Highest mean temp.	81°·5 at Colombo, Ceylon.
Lowest „ „	33°·4 at Winnipeg.
Driest station	Adelaide, mean humidity 59.
Dampest station	Esquimalt, „ „ 87.
Highest temp. in sun	177°·0 Trinidad.
Lowest temp. on grass	−23°·5 at Toronto*.
Greatest rainfall	101·06 in. at Colombo, Ceylon.
Least „	15·17 in. at Adelaide.
Most cloudy station	Esquimalt, average amount 6·9.
Least „ „	Grenada, average amount 3·6.

* The min. on grass is not recorded at Winnipeg.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE FOR 1896.

Stations. *Those in Italics are South of the Equator.*	Absolute.				Average.					Absolute.		Total Rain.		Average.
	Maximum.		Minimum.		Max.	Min.	Mean.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.	Cloud.
	Temp.	Date.	Temp.	Date.										0—10
	°		°		°	°	°	°		°	°	in.		
England, London ...	88·7	July 14	23·2	February 26	58·5	43·3	50·9	43·7	80	135·9	19·1	23·52	159	6·3
Malta	104·8	August 11	40·1	January 21, February 18	71·9	59·2	65·5	56·1	77	152·0	33·0	21·96	79	5·3
Mauritius	86·6	Dec. 19, 21	57·0	July 5	79·0	68·7	73·8	64·5	76	138·2	46·6	68·17	175	5·6
Calcutta	106·8	April 15	45·5	December 22	88·1	70·6	79·4	67·4	70	159·5	35·3	53·22	76	4·1
Bombay	95·0	October 29	63·2	December 31	86·7	76·0	81·4	72·5	75	143·7	51·9	87·65	102	...
Ceylon, Colombo ...	93·4	February 27	67·5	February 2	87·1	75·8	81·5	73·0	80	162·0	60·0	101·06	193	5·9
Melbourne	108·0	January 23	32·9	July 31	67·0	49·5	58·2	48·8	72	155·0	23·0	24·89	124	5·9
Adelaide.....	111·2	January 23	34·4	July 10	73·8	53·0	63·4	47·4	59	172·0	26·4	15·17	121	4·8
Sydney	108·5	January 13	39·8	July 2	69·6	56·6	63·1	56·5	76	160·9	27·9	42·42	157	4·7
Wellington.....	79·0	February 22	34·0	Aug. 5, 6, 10, October 1	61·5	49·5	55·5	46·6	73	141·0	21·0	57·54	179	4·5
Auckland	84·0	February 8	38·0	August 11	65·9	53·1	59·5	50·1	72	147·0	32·0	37·79	...	5·3
Jamaica, Kingston..	93·9	July 13	62·7	January 15	87·8	71·9	79·9	69·1	72	...	...	19·01	81	5·0
Trinidad.....	94·0	May 19, 20, June 6	61·0	March 15	88·3	70·3	79·3	72·0	80	177·0	60·0	66·45	178	..
Grenada	88·4	October 19	67·2	November 30	82·9	73·6	78·3	70·4	76	161·8	...	99·94	243	3·6
Toronto	91·3	July 12	—17·2	February 17	54·1	36·8	45·4	38·7	75	107·0	—23·5	29·14	144	5·9
New Brunswick, Fredericton.....	92·7	August 11	—20·0	February 18	50·2	29·0	39·6	32·3	69	...	...	39·17	128	5·2
Manitoba Winnipeg	90·5	July 1	—45·2	January 4	44·7	22·2	33·4	...	...	...	...	26·29	143	5·7
British Columbia, Esquimalt	86·4	June 26	16·7	November 27	55·3	41·4	48·4	43·6	87	...	...	46·47	157	6·9

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HIGH TEMPERATURE ON THE NIGHT OF AUGUST 4TH.

To the Editor of the Meteorological Magazine.

SIR,—The minimum temperature as registered in my Stevenson screen on the night of Wednesday, August 4th [*i.e.*, the min. of August 5th.—ED.] was 65°. This is the highest minimum I have recorded during 11 years; the nearest approach to it being 63°·7 on July 1st, 1894. The maximum during the previous day had been 82°·8, with a strong S.E. wind. It came over partially cloudy during the evening, and about 7 o'clock there was a slight shower, yielding ·01 in.; notwithstanding this shower the temperature at 10 p.m. was 70°. The above readings are certainly very unusual in North Lancashire. The screen is situate about 74 ft. above sea level. The thermometers are by Negretti and Zambra, and have Kew certificates.

Yours faithfully,

SYDNEY WILSON.

Bruna Croft, Garstang, August 5th, 1897.

We confess to having a feeling of ignorance on the subject of high minimum temperatures, and, therefore, on receipt of the above referred to our own records. The minimum at Camden Square on the 5th was 59°·4, a value exceeded by 61°·1 on 6th, and by 60°·4 on 11th.

Looking back over the 40 years, 1858 to 1897, over which the record extends, we find no fewer than 85 instances of min. temp. of 60°, or upwards, in August, an average of rather more than two per annum, while the years in which the August minima were invariably below 60° are 1860, 1862, 1866, 1869, 1872, 1874, 1879, 1881, 1885, 1889, and 1894; in all eleven, or about one year in four. Taking now the highest record in 1897 (61°·1) we find 36 instances. or rather less than one per annum, in which it was exceeded, the most remarkable August being that of 1893, when for nine consecutive days the shade temp. did not fall below 60°.

Min. in shade August, 1893.

9th	60°·0	12th	63°·3	15th	64°·1
10th	63·9	13th	60·2	16th	63·8
11th	61·8	14th	61·3	17th	63·7

In six Augusts there were five or more days on which the temp. did not fall below 60°, namely :—

1868 ..... 5 days.	1876 ..... 5 days.	1884 ..... 6 days.
1875 ..... 6 ,,	1877 ..... 5 ,,	1893 ..... 9 ,,

On fifteen days in the 40 Augusts the min. did not fall below 63°, the records of 64°, or upwards, being :—

Aug. 18th, 1858 ..... 67°·0.	Aug. 18th, 1876 ..... 65°·8.
,, 7th. 1868 ..... 64·0.	,, 18th, 1893 ..... 64·1.

From this it is obvious that the Camden Square minima on August 5th and 6th, 1897, were in no way remarkable, but it must not be for-

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gotten (I.) that the reading at Garstang was nearly 4° higher, and (II.) that what is an average reading at London may be a very exceptional one in North Lancashire.

The following table, extracted from the Daily Weather Reports, shows clearly that the nights of August 5th and 6th were very warm over the whole of England, and that the 5th was the warmer. The reading at Liverpool, the nearest station to Garstang, on 6th (64°) is very accordant with the 65° at Bruna Croft, and proves the accuracy of Mr. Wilson's instruments and observations.

The temperatures for the warmer night are given in Roman, for the cooler in italic, type.

Minimum Temperatures in England and Wales, August 5th & 6th, 1897.

	5th.	6th.		5th.	6th.
	°	°		°	°
North Shields	59	*58*	Oxford	*57*	59
York	*59*	60	London, Brixton	62	*61*
Spurn Head	61	61	North Foreland	*64*	66
Liverpool, Bidston	64	*59*	Dungeness	63	*60*
Holyhead	61	*59*	Hurst Castle	67	*64*
Loughborough	59	*58*	Prawle Point	60	60
Yarmouth	62	62			
Cambridge	58	58	Mean	61·1	60·3
Pembroke, St. Ann's Head	60	60			

NOTES OF DAMAGE BY RAIN AND THUNDERSTORMS, EXTRACTED FROM THE NEWSPAPER PRESS.

Monday, August 2nd.

Aberdeenshire.—Severe H storm, doing damage in the parishes of Premnay, Leslie, Keig, Tullynessle and Forbes, comparable to that of the storm in Essex on June 24th, the damage being estimated at more than £2,000. Almost every window facing N. or W. was broken.

Thursday, August 5th.

Herts.—At Tring Agricultural Society's Show a young man and woman sheltering under a tree were killed by L.

Royston.—Cellars were flooded and poultry drowned, and H stones fell, breaking glass in greenhouses.

Northamptonshire.—The thatched roof of Horspool Farm, Draughton, was fired by L, and the building was destroyed all but the walls.

At Raunds a tree was struck, and at Hargrave trees were struck and a cow was killed.

Hayricks were ignited at Draughton, and heavy H fell.

Huntingdon.—A labourer working in a field at Godmanchester had his left arm struck by L, and had to be removed in a cart.

Rutland.—L struck a house in Braunston Road, Oakham, passed down a chimney, and moved the fire-grate to the centre of the room.

Leicestershire.—At Market Harborough the basements of several houses were flooded.

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Derbyshire.—Fletcher's Lace Factory, Osmaston Road, Derby, was struck by L, and the roof much damaged.

Lancashire.—At Liverpool H as large as marbles fell, and at Herculaneum graving dock a man was killed.

St. Helen's.—In 45 minutes 2·28 in. of R fell.

Ramsbottom, near Bury.—A young man named Booth was struck and killed.

Large H fell at Heywood, and a farm house and dwelling were struck by L. A telegraph pole also was struck, and a passing horse bolted, the two occupants of the carriage being thrown out and injured.

Rochdale.—Many buildings flooded, and much damage at Horse Carrs Mills, Shawclough.

At Ashworth a farmer was injured, and at Whitworth a quarryman was killed.

Feniscowles, near Blackburn.—A farmer of Leyland was found dead in the road, having been struck by L while driving a trap.

At Chatburn a farmer was struck while in a field and killed instantly. A barn in the same neighbourhood was fired.

SUNDAY, AUGUST 8TH.

Norfolk, Lynn.—A tremendous, and most acceptable, downpour of rain occurred, falling in torrents for two hours in the afternoon, and houses in some parts of the town, especially in the neighbourhood of Windsor Road and Lower Canada, became flooded, some of them to a depth of two feet, in consequence of the sewers being unable to carry off the surplus waters. The tide in the river Ouse, into which the sewers discharge, was high at the time, and consequently the outlets were blocked, hence the mischief.

The rain gauge at the Manure works in Wisbeach Road, recorded 3·48 in. between 9 a.m. on Saturday and 9 a.m. on Monday.

Worcestershire.—At the Waterworks, Worcester, 1·46 in. of R fell, and the cellars of several houses in the low lying parts of the city were flooded.

Droitwich.—A heavy downpour of rain commenced at 8.30 a.m., and continued without intermission till mid-day. High Street was flooded for a length of 50 yards, and many persons had to take refuge in the upper floors of their dwellings. The steam fire engine was employed from 1.30 p.m. to 7.30 p.m., pumping the water from the roadway.

A portion of the embankment of the L. & N.W.R. between Spon Lane and Smethwick was washed away. The G.W.R. at West Bromwich was flooded, the water being three feet deep between the Trinity Road and Spon Lane bridges.

WEDNESDAY, AUGUST 11TH.

Dumfriesshire.—A shepherd was killed by L between Holmshaw and Earlshaugh, in Upper Annandale.

Edinburgh.—About midday, an electric lamp was struck by L at North Bridge, Edinburgh.

Lanark.—Between 4 p.m. and 5 p.m. a house in Barrfield Terrace, Uddingston, was struck, and a tree had its bark stripped off.

Ayrshire.—At Bogside, near Ayr, a brood mare was killed, the tail and hind quarters being scorched.

Saltcoats.—In Quay Street, at the Braes, in Green Street and Vernon Street, houses were flooded.

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Dumbartonshire.—The cutting at Dalmuir on the North British Railway, was flooded, and traffic had to be stopped. All the low lying lands were flooded, and much damage was done to the crops. At Dumbarton East Station the water inundated the booking office, and at Burnside and in Bruce Street several houses were flooded.

Vale of Leven.—L struck a gas pipe at Renton Church, ignited the gas and set fire to the flooring.

Stirlingshire.—Water ran down the streets from the higher parts of Stirling like so many streams. At the foot of King Street serious flooding took place.

Kinrossshire.—Three cows were killed at Goudierannet, and twenty sheep at Thomanean. Three ricks were fired in the county. The rain was mixed with H and large pieces of ice, and much damage was done by flooding. Kinross High Street was covered in parts to a depth of several feet, and houses were flooded.

Fife.—Dunfermline. Great darkness, some H and torrents of R for half an hour. At the junction of Bridge Street and Chalmers Street the sewer was unable to carry off the water, which found its way into cellars and shops. At Low Beveridgewell a culvert burst, flooding Harriebrae Mills. At Pilmuir Street houses were flooded to a depth of two feet. At Townhill a house and several trees were struck by L.

Perth.—A cow was killed at Kippenross Park, Dunblane; a tree was struck and telephone wires were broken.

SUNDAY, AUGUST 15TH.

Banff.—The house 30, Market Street, Macduff, was struck by L, the current passed down a vent, and the grate was torn out and dashed six feet across the room.

TUESDAY, AUGUST 17TH.

Selkirk.—In the Yarrow valley and St. Mary's Loch district the rainstorm was exceptionally heavy. The hill burns in the valley and in Moffatdale came down like cataracts, and between St. Mary's Loch and Moffat the coaches had to traverse stretches of water, at some places three feet deep. The Yarrow and Ettrick were in heavy flood, and a bridge over Summerhope Burn, near Rodono Cottage, was swept away, rendering the road to Tibbie Shiel's impassable. Flooding took place at Chapelhope farm, and the road between this place and Oxcleuch was blocked, the burn bringing down with it tons of gravel and refuse. A bridge near the Grey Mare's Tail is also reported to have been swept away, In Moffat district about four o'clock there was an abnormal downpour, which resembled the bursting of a waterspout, and which lasted about twenty minutes. The river Annan rose rapidly, submerging holms below the town, and at the bridge near the railway station the volume of water filled the arch, and fears were entertained for the safety of the structure.

WEDNESDAY, AUGUST 18TH.

Bucks.—A bullock grazing in a field at Taplow was struck by L.

Warwick.—A chimney at 52, Darwin Street, Birmingham, was struck and fell through the roof, causing considerable injury. A building on Alcester Road, also was struck.

Glamorgan,—At Gendros, near Cockett, Swansea, five persons were assembled in a house, when it was struck by L; they were all thrown to the ground, a young woman had her face scorched, and a youth was burnt about the body.

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THURSDAY, AUGUST 19TH.

Essex.—At Great Braxted, near Witham, a man named Crisp, was ploughing with two horses, when both man and team were struck dead by the L.

Kent.—Two cottages at Borden were struck by L and burnt down, and the inmates had to escape in their nightclothes. At Sittingbourne three houses were wrecked by L, and at Murston a barn was destroyed and a horse killed.

The steam trawler Strathisla, off Wick, had the foremast repeatedly struck by L, and splintered in several places. One compass was rendered useless and the other seriously affected. The mate was stunned by the L.

ELECTRICAL MANIFESTATIONS (?)

The following letter, extracted from the *English Mechanic* of August 20th, 1897, which differs in several particulars from the usual descriptions of ball lightning, at once recalled to our memory a very similar phenomenon, described by Mr. H. S. Eaton, at the meeting of the Royal Meteorological Society, on June 15th, 1887, of which we append an abstract. Other accounts of somewhat similar phenomena will be found in the *Quar. Jour. Roy. Met. Soc.*, XIII. (1887), p. 306.

Lightning Phenomena.—[40200.]—A few days since we had a very heavy thunderstorm. Immediately following one of the earliest flashes of lightning three people in my house saw, at the distance apparently of some 400 yards, a number of globes of fire (about twenty or so) rolling down a precipitous scar on the other side of this valley. These balls or globes appeared to follow each other at very brief intervals; probably several seconds passed from the first to last. Ball lightning has been observed about here during severe storms from time to time, though seldom: but I have never witnessed during a long sojourn, nor do I hear of anyone having seen before, anything at all approaching the phenomenon described. I shall be glad if any of your readers can explain, or to hear if anyone has seen a similar thing.

Aug. 14. C. F. R.

Note on a Display of Globular Lightning at Ringstead Bay, Dorset, on August 17th, 1876. By Mr. H. S. EATON, M.A., F.R.Met.Soc. Between 4 and 5 p.m. two ladies who were out on the cliff, saw, surrounding them on all sides, and extending from a few inches above the surface to two or three feet overhead, numerous globes of light, the size of billiard balls, which were moving independently and vertically up and down, sometimes within a few inches of the observers, but always eluding the grasp; now gliding slowly upwards two or three feet, and as slowly falling again, resembling in their movements soap bubbles floating in the air. The balls were all aglow, but not dazzling, with a soft, superb iridescence, rich and warm of hue, and each of variable tints, their charming colours heightening the extreme beauty of the scene. The subdued magnificence of this fascinating spectacle is described as baffling description. Their numbers were continually fluctuating; at times thousands of them enveloped the observers, and a few minutes afterwards the numbers would dwindle to perhaps as few as twenty, but soon they would be swarming again, as numerous as ever. Not the slightest noise accompanied the display.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MARCH, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	Total Rain. Depth.	Total Rain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	61·7	23	26·8	30	52·3	39·2	39·6	81	101·9	20·5	3·42	17	6·6
Malta	79·2	29	44·1	9	64·1	51·5	49·3	79	155·2	41·0	·75	7	4·5
Mauritius	86·0	5, 8	66·1	17	83·9	72·3	67·9	74	135·0	59·6	·88	10	6·0
Calcutta	98·9	10	63·9	13	89·9	70·6	64·2	61	154·0	56·9	1·37	3	2·9
Bombay	86·0	28	66·1	1	84·3	71·2	68·2	73	135·5	58·1	·00	0	1·0
Ceylon, Colombo	93·2	2	73·6	15	90·0	76·5	73·3	76	147·0	68·0	3·66	13	3·2
Melbourne	89·6	13	38·9	20	69·9	51·2	48·8	67	139·9	28·9	1·49	10	6·3
Adelaide	95·5	28	47·9	25	76·8	57·8	50·1	56	156·8	36·7	·58	10	5·8
Sydney	92·9	14	51·8	11	74·6	61·0	57·6	72	145·3	44·8	3·34	17	4·3
Wellington	75·5	15	41·7	31	66·2	53·5	49·4	69	133·0	33·0	2·06	16	4·5
Auckland	79·0	20	49·0	27	71·4	57·0	55·1	72	145·0	45·0	3·29	12	4·8
Jamaica, Kingston	91·3	17	65·1	12	86·4	69·6	66·5	70	...	...	·13	1	3·3
Trinidad	89·0	10*a*	64·0	23	86·7	68·8	75·2	77	164·0	63·0	3·96	13	...
Grenada	89·8	28	70·0	2	86·3	72·8	77·7	75	155·0	...	6·04	15	5·8
Toronto	53·0	30	1·8	1	38·5	24·6	25·7	74	71·0	—2·2	2·97	15	6·0
New Brunswick, Fredericton	46·9	31	—14·3	1	34·3	15·4	18·8	63	...	...	4·53	17	6·1
Manitoba, Winnipeg	51·9	31	—33·7	15	23·8	—1·5	...	...	...	...	1·58	9	...
British Columbia, Esquimalt	53·1	25	27·7	10	44·5	32·5	34·0	86	...	...	4·64	20	7·2

a—and 16, 21.

REMARKS.

MALTA.—Adopted mean temp. 56°·6, or 0°·9 above the average. Mean hourly velocity of wind 11·8 miles. TS on 8th. L on 4 days. Average temp. of sea 60°·8.
J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·1, of dew point 1°·9, and rainfall 7·28 in. below, their respective averages. Mean hourly velocity of wind 10·1 miles, or 0·1 above the average; extremes 23·1 on 22nd and 1·8 on 11th; prevailing direction E.S.E. T on 2nd, L on 3rd, and T and L on 4th. Rainfall ·88 in., against an average for 23 years of 8·16 in., being the least in March during the period 1875–97. T. F. CLAXTON.

CEYLON, COLOMBO.—TS8 occurred on the 27th, 29th, and 30th. L was seen on 8 days. H. O'HARNARD.

Adelaide.—Mean temp. 3°·2 below the average for 40 years. The coldest March, with one exception (1885), in the 40 years. Rainfall ·50 in. below average.
C. TODD, F.R.S.

Sydney.—Temp. 1°·5 below, rainfall 2·04 in. below, and humidity 4·5 below, their respective averages. Severe drought over fully half of New South Wales, the other part having good rains. H. C. RUSSELL, F.R.S.

Wellington.—Up to the 20th generally fine with occasional showers, wind chiefly S.E. and N.W.; the latter part of the month showery. Five days of strong N.W. wind. Slight earthshake on 20th. Temp. 2°·3 below, and R 1·48 in. below, their respective averages. R. B. GORE.

Auckland.—Rather wet and stormy during most of the month. The rainfall being almost an inch above the average. Mean temp. close to the average; barometric pressure much below. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—The rainfall throughout the Island gives a better result than the two preceeding months, being about two-thirds of the average. J. F. BRENNAN.

TRINIDAD.—Rainfall 2·09 in. above the average of 30 years. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, AUGUST, 1897.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	2·34	XI.	Rhayader, Nantgwillt ...	6·04
II.	Dorking, Abinger Hall .	3·81	,,	Lake Vyrnwy	6·29
,,	Birchington, Thor	2·27	,,	Corwen, Rhug	3·97
,,	Hailsham	3·94	,,	Criccieth, Talarvor	4·46
,,	Ryde, Thornbrough	4·22	,,	I. of Man, Douglas	3·90
,,	Emsworth, Redlands ...	4·19	XII.	Stoneykirk, Ardwell Ho.	5·52
,,	Alton, Ashdell	4·43	,,	New Galloway, Glenlee	7·89
III.	Oxford, Magdalen Col..	3·55	,,	Moniavie, Maxwelton Ho.	7·22
,,	Banbury, Bloxham	3·93	,,	Lilliesleaf, Riddell	3·95
,,	Northampton, Sedgebrook	4·79	XIII.	N. Esk Res. [Penicuick]	4·05
,,	Duddington [Stamford].	3·00	XIV.	Glasgow, Queen's Park..	5·51
,,	Alconbury	2·92	XV.	Inverary, Newtown	8·14
,,	Wisbech, Bank House...	3·07	,,	Oban, The Corran	...
IV.	Southend	2·25	,,	Islay, Gruinart School ...	2·63
,,	Harlow, Sheering..... ...	3·98	XVI.	Dollar.....	6·17
,,	Colchester, Lexden	2·04	,,	Balquhidder, Stronvar...	11·93
,,	Rendlesham Hall	1·95	,,	Ballinluig	6·55
,,	Rushall Vicarage	3·17	,,	Dalnaspidal H.R.S.....	9·56
,,	Swaffham	3·12	XVII.	Keith H.R.S.....	3·45
V.	Salisbury, Alderbury ...	2·74	,,	Forres H.R.S.	2·49
,,	Bishop's Cannings	4·82	XVIII.	Fearn, Lower Pitkerrie..	2·16
,,	Blandford, Whatcombe .	3·50	,,	N. Uist, Loch Maddy ...	3·95
,,	Ashburton, Holne Vic...	7·83	,,	Invergarry	3·43
,,	Okehampton, Oaklands.	7·37	,,	Aviemore H.R.S.	3·03
,,	Hartland Abbey	5·00	,,	Loch Ness, Drumnadrochit	2·82
,,	Lynmouth, Glenthorne.	4·88	XIX.	Invershin	1·84
,,	Probus, Lamellyn	4·09	,,	Scourie	...
,,	Wellington, The Avenue	4·18	,,	Watten H.R.S.....	2·63
,,	Wincanton.....	4·71	XX.	Dunmanway, Coolkelure	9·32
VI.	Clifton, Pembroke Road	6·37	,,	Cork, Wellesley Terrace	4·33
,,	Ross, The Graig	3·92	,,	Killarney, Woodlawn ...	7·95
,,	Wem, Clive Vicarage ...	3·08	,,	Caher, Duneske	5·10
,,	Cheadle, The Heath Ho.	4·52	,,	Ballingarry, Hazelfort...	4·63
,,	Worcester, Diglis Lock	4·55	,,	Limerick, Kilcornan ...	4·51
,,	Coventry, Priory Row...	3·97	,,	Broadford, Hurdlestown	5·84
VII.	Grantham, Stainby	3·72	,,	Miltown Malbay	7·05
,,	Horncastle, Bucknall ...	3·34	XXI.	Gorey, Courtown House	4·99
,,	Worksop, Hodsck Priory	2·16	,,	Athlone, Twyford	5·55
VIII.	Neston, Hinderton	2·80	,,	Mullingar, Belvedere ...	6·51
,,	Southport, Hesketh Park	3·26	,,	Longford, Currygrane...	5·72
,,	Broughton-in-Furness ...	7·09	XXII.	Woodlawn	7·08
IX.	Ripon, Mickley.....	3·31	,,	Crossmolina, Enniscoe ..	7·30
,,	Melmerby, Baldersby ...	...	,,	Collooney, Markree Obs.	6·23
,,	Scarborough, Observat'y	3·58	,,	Ballinamore, Lawderdale	6·74
,,	Middleton, Mickleton ...	4·43	XXIII.	Warrenpoint.....	5·66
X.	Haltwhistle, Unthank...	3·82	,,	Seaforde.....	4·64
,,	Bamburgh	2·27	,,	Belfast, Springfield	5·44
,,	Keswick, The Bank	8·92	,,	Bushmills, Dunlarave..	4·73
XI.	Llanfrechfa Grange	8·22	,,	Stewartstown	5·15
,,	Llandovery	6·80	,,	Killybegs	6·87
,,	Castle Malgwyn	4·59	,,	Lough Swilly, Carrablagh	4·11
,,	Builth, Abergwesyn Vic.	7·57			

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AUGUST, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	In shade.	No. of Nights below 32°
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·92	+ 1·04	·76	8	16	88·4	5	48·1	13	0	
II.		Tenterden ...	3·23	+ 1·37	·62	26	18	85·0	4	50·0	12*c*	0	
„		Strathfieldsaye ...	3·54	...	·75	31	17	...	...	...	...	...	
III.		Hitchin ...	2·07	+ ·25	·39	30	15	85·0	4, 5	47·0	12	0	
„		Winslow (Addington) ...	5·68	+ 3·71	1·04	24	21	87·0	4, 5	47·0	13	0	
IV.		Bury St. Edmunds (Westley)	4·76	+ 2·56	1·88	25	16	79·0	5	49·0	26	0	
„		Norwich (Brundall) ...	1·27	...	·27	8	15	84·0	4	46·0	26	0	
V.		Weymouth(LangtonHerring)	...	...	...	...	...	...	...	...	...	...	
„		Torquay (Cary Green)	3·31	...	·54	30	20	72·1	5	49·5	27	0	
„		Polapit Tamar [Launceston]..	5·85	+ 3·37	·90	30	26	79·7	3	46·8	27	0	
VI.		Stroud (Upfield) ...	5·59	+ 3·50	·98	30	24	85·0	4	51·0	28	0	
„		ChurchStretton(Woolstaston)	3·32	+ ·56	·42	7, 18	20	82·0	4	46·0	27	0	
„		Tenbury (Orleton) ...	...	...	...	...	...	...	...	...	...	...	
VII.		Leicester (Rotherby Hall) ...	3·34	...	·77	30	21	88·0	5	42·0	3*d*	0	
„		Boston ...	2·27	+ ·15	·80	8	15	90·0	4	42·0	26	0	
„		Hesley Hall [Tickhill]...	2·43	+ ·27	·65	30	18	90·0	5	43·0	3	0	
VIII.		Manchester(PlymouthGrove)	4·04	+ ·95	·90	6	23	89·0	4	42·0	29	0	
IX.		Wetherby (Ribston Hall) ...	3·52	+ 1·18	·71	24	19	...	...	...	...	...	
„		Skipton (Arncliffe) ...	8·78	+ 4·45	2·75	5	22	...	...	...	...	...	
„		Hull (Pearson Park).	2·79	+ ·15	·87	26	15	81·0	5	45·0	3	0	
X.		Newcastle (Town Moor) ...	2·87	+ ·16	·62	24	17	...	...	...	...	...	
„		Borrowdale (Seathwaite)...	17·38	+ 8·93	2·42	13	24	...	...	...	...	...	
XI.	WALES.	Cardiff (Ely)...	7·97	+ 4·36	1·17	30	21	...	...	...	...	...	
„		Haverfordwest	6·15	+ 2·97	·64	23	22	80·8	3	44·0	27	0	0
„		Aberystwith (Gogerddan) ...	3·82	...	·44	7	21	86·0	3	38·0	9*e*	0	
„		Llandudno...	3·03	+ ·67	·70	10	21	85·0	3	51·2	29	0	
XII.	SCOTLAND.	Cargen [Dumfries]	5·66	+ 2·67	·68	29	21	82·0	3, 4	42·0	19	0	
XIII.		Edinburgh (Blacket Place)...	4·24	...	·99	4	19	78·1	21	48·6	19	0	0
XIV.		Colmonell	6·21	...	1·10	29	21	87·0	3	44·0	18	0	
XV.		Lochgilphead (Kilmory).....	5·51	+ ·95	·62	29	20	...	...	47·0	9*f*	0	
„		Mull (Quinish)...	4·12	— ·03	·62	16	21	...	...	...	...	...	
XVI.		Loch Leven Sluices ...	4·60	+ 1·66	1·00	12	14	...	...	...	...	...	
„		Dundee (Eastern Necropolis)	3·25	+ ·68	·45	13	22	79·6	7	43·8	19	0	
XVII.		Braemar	5·06	+ 1·73	·66	28	25	76·3	1	37·2	19	0	3
„		Aberdeen (Cranford)	3·07	...	·83	11	20	74·0	4	43·0	21*g*	0	
„		Cawdor (Budgate) ...	2·43	+ ·18	·55	11	18	...	...	...	...	...	
XVIII		Strathconan [Beauly] ...	2·98	— ·32	·54	14	11	...	...	...	...	...	
„		Glencarron Lodge...	5·15	...	·72	17*a*	21	78·0	5	41·0	22	0	
XIX.		Dunrobin ...	2·57	+ ·17	·44	11	15	68·0	2, 5	44·0	23	0	
„		S. Ronaldsay (Roeberry).....	2·32	— ·24	·58	11	17	70·0	4	47·0	22*h*	0	
XX.		Darrynane Abbey...	5·73	...	·60	29	27	...	...	...	...	...	
„		Waterford (Brook Lodge) ...	5·45	+ 2·03	·76	23	23	79·0	2	43·0	20	0	
„		O'Briensbridge (Ross) ...	5·56	...	·62	7	25	...	...	...	...	...	
XXI.		Carlow (Browne's Hill) ...	5·74	+ 2·77	·77	20	22	...	...	...	...	...	
„		Dublin (FitzWilliam Square)	3·79	+ 1·27	·90	7	23	76·8	4	49·2	19	0	0
XXII.	IRELAND.	Ballinasloe	7·00	+ 3·82	1·13	29	24	74·0	2, 3	48·0	23	0	
„		Clifden (Kylemore)	14·46	...	1·90	30	25	...	...	...	...	...	
XXIII		Waringstown ...	4·79	+ 1·68	·98	29	18	82·0	1	40·0	10	0	
„		Londonderry (Creggan Res.).	4·15	+ ·03	·49	10	25	...	...	...	...	...	
„		Omagh (Edenfel) ...	6·11	+ 2·62	1·10	10*b*	21	78·0	1	45·0	9	0	

+Shows that the fall was above the average ; —that it was below it.

a—and 20. *b*—and 29. *c*—and 13, 16, 26. *d*—and 26, 29. *e*—and 22, 24. *f*—and 18, 21, 26. *g*—and 31. *h*—and 23.

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METEOROLOGICAL NOTES ON AUGUST, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Hot and dry at first, showers in third week were helpful to grass and hops, but prevented completion of harvest, which was still further delayed by heavier rains towards the end of the month. Sunshine 225 hours 40 mins., or more than 50 per cent. above last year. Mean max. temp. 2° higher, and min., both in screen and on grass, 5° higher. Min. on 5th 63°. TS on 8th from 4 to 5 p.m., and on 19th, 3 to 4 a.m. TSS around on 25th, sharp at 1 to 1.30 p.m.

ADDINGTON.—The greatest August rainfall during the last 27 years. The month began with a high max. temp., lasting until the 5th, on which day a heavy TS passed over us; a fine young cedar of Lebanon on the lawn and close to the Manor was split by L from top to bottom. The remainder of the month was very unsettled. On the 30th, at 5 p.m., a heavy downpour of rain gave ·20 in. in ten minutes. Dense fog on the morning of the 25th.

BURY ST. EDMUNDS, WESTLEY.—The wettest August I have recorded during the last 40 years. The nearest to it was 1881 with 4·73 in. Nevertheless most of the corn is well harvested. On the 25th we had a very heavy TS with much H, which did great damage to the mangolds and turnips, but it did not extend over a large area. The month has been hot, the max. temp. has not been below 63°. TSS on the 5th, 18th and 25th; distant T on 13th and 19th.

NORWICH, BRUNDALL.—Mean temp. 63·4, being the highest in any August since 1893, and in any month, with that exception, since July, 1887. The rainfall was, in this neighbourhood, very partial, and we still felt the effects of the drought at the end of the month. Out of the 15 days on which rain was recorded, 12 gave less than a tenth of an inch. At the Norwich Cemetery the total was 2·15 in. against our 1·27 in. T and L on 5th, 19th, 22nd and 31st. T on 8th, 18th and 28th. L on 24th. TSS on 25th at 10.30 a.m., at 2 and 4 p.m. Solar halo on 26th, p.m.

POLAPIT TAMAR—A wet month, the total exceeding double the average. The total for the first eight months of the year is 26·86 in. as against 12·92 in. for the corresponding period in 1896, *i.e.*, more than twice as much. The first few days of the month were very seasonable, hot and dry, but the last were very wet and stormy.

STROUD, UPFIELD—TS on 6th, about 5 p.m., from S.W., ·23 in. of rain fell. Small TS on 18th, from 5.30 to 6.30 p.m., ·50 in. of R falling, and heavy TS to the N. and S. of us. T on 5th, 8th, 23rd, and L and T on 31st from 11 a.m. to noon.

WOOLSTASTON.—The first week was very hot and sultry, but after a heavy storm of T and L on the 6th the weather broke up, and the temp. fell considerably, R falling nearly every day for the rest of the month.

ROTHERBY HALL.—The weather during the first fortnight in August was very hot, and the rain which fell after the 18th was very acceptable, following the almost continuous dry weather of the previous eight weeks. There was T on seven days during the month, with no fewer than five TSS on the 24th. The rainfall was ·88 in. above the average for 1880-9. Exactly 15 inches fell here during the first eight months of 1897, against 12·58 in. for the same period of 1896. Mean shade temp. 61°.

SKIPTON, ARNCLIFFE.—A very wet month, the record of the 5th being the highest which has been recorded on one day for many years. The TS on the 5th very severe. Two cattle were killed, and three ash trees struck. Can any of your readers tell us why ash trees are more frequently struck than others?

WALES.

HAVERFORDWEST.—The first five days of August were very fine, and great heat prevailed, with a very large share of sunlight hastening the ripening of

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the corn. The weather changed on the 6th, and very heavy showers fell (principally at night) and in a very short time, at 1.30 a.m. on the 8th, ·33 in. fell in 35 minutes, and this was not a solitary instance. This kind of weather continued for several days. The weather improved a little after the 17th, although showery; the 19th very fine and breezy, but R fell heavily at night, three-tenths in 25 minutes. From that date to the end of the month, with an occasional fine day, the weather became worse and worse up to the end; the excessive R, coupled with the high night temp., is causing much anxiety about the harvest, which, but for this disastrous weather, would have been a very good one. In August, 1879, 7·59 in. fell, since that period we have had nothing to equal 1897.

ABERYSTWITH, GOGERDDAN.—Very showery after the first week.

SCOTLAND.

CARGEN [DUMFRIES].—The favourable weather experienced in July continued only during the first four days of this month. Upon the 3rd and 4th the thermometer reached 82°, the highest point registered during the summer; on the 5th there was a sudden fall of temp., and R was registered on every day, except six, during the remainder of the month. The readings of the bar. never exceeded 30 in. after the 4th, and the mean bar. pressure has only once been lower since observations were commenced at this station in 1860. The mean temp. 59°·8 is 1°·5 higher than the average for August, and has only once, in 1893, been higher since 1880; during the first nine days the mean reading exceeded 65°, from 10th to 31st it was only 57°·6. The rainfall is very considerably above the average, and has only been greater in six during the last 38 years. The weather has proved disastrous to the corn crop, hardly a stack having been as yet secured. Turnips are showing signs of a singular disease, taking the form of a rot in the upper portion of the bulb, no doubt occasioned by the constant wet weather following an unusually vigorous growth in the early stages of the crop. Potatoe disease is also prevalent. T and L at 7 p.m. on 4th, and all day 5th. T at 11 p.m. on 14th, and on 25th.

EDINBURGH, BLACKET PLACE.—A sunny, warm and wet month. Mean pressure ·178 in. below, temp. 2°·6 above average. R ·76 in. above mean. Bright sunshine 181 hours, and only one sunless day. First 12 days very hot, mean temp. 63°·6. Severe TSS on 4th, 5th, 6th, and 7th.

COLMONELL.—R 2·21 in., and mean temp. 2°·5 above, the average of 21 years. T and L on 4th, and T on 14th and 24th.

MULL, QUINISH.—The weather broke up on the 13th, and until the end of month has been very unsettled, with wind continually from S. and S.W.

BRAEMAR.—A very broken, unsettled month.

ABERDEEN, CRANFORD.—Strong winds from 12th to 20th, and little sun.

S. RONALDSAY, ROEBERRY.—Very fine, slight TSS on the 2nd and 17th.

IRELAND.

O'BRIENSBRIDGE, ROSS.—Great injury to corn, hay and potatoes by constant R.

DUBLIN, FITZ WILLIAM SQUARE.—A changeable, showery, windy month, but tolerably warm, in fact, great heat prevailed during the first week, which was in all respects summerlike. Mean temp. 60°·8, or 1·1 above the average. High winds were noted on 16 days. T on 14th. L and T on the 18th.

EDENFEL.—The warm summerlike period which commenced on the 9th of July, and was only broken during that month for a short spell in its fourth week, continued with but little intermission until the 9th of August, and it would in consequence be difficult to exaggerate the resulting abundance and luxuriance of all vegetation. But from the 10th of August to the end there was nothing but rainy, unsettled, and more or less tempestuous weather, continuing through the first week of September, so that potatoes, cereals and the ungathered hay are all in serious danger. The rainfall of the year to 31st August 33·27 in. is 10·76 in. above the average, and far in excess of the record for any similar period during the past 33 years.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXI.] OCTOBER, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

WEATHER MAPS AND EARLY SYNCHRONOUS METEOROLOGICAL OBSERVATIONS.

IN the United States *Monthly Weather Review* for May, 1897, there appears a letter of unique interest with respect to the above-mentioned subjects.

Prof. Henry, the Secretary of the Smithsonian Institution, being anxious to organise a meteorological service in the United States, wrote on June 5th, 1850, to Mr. Glaisher, enquiring what was being done in this country. Mr. Glaisher wrote a long reply, and that reply has been found among the Smithsonian archives by Prof. Cleveland Abbe, and printed in the above-mentioned *Weather Review.*

As we have here Mr. Glaisher's own statement at the very time when the work was being arranged, the letter is so important that we reprint it *verbatim,* and will add a few comments at the end.

MY DEAR SIR,—In reply to your letter of June 5 I beg to say that I shall have great pleasure in sending you copies of the forms I use in collecting meteorological observations, and the results of my experience are entirely at your service. In your letter you have not indicated the channel through which you wish the papers to be sent, and, therefore, I shall forward them through the Royal Society.

With the papers I shall send you will find a few copies of an address of a new Society, which myself with a few gentlemen have formed. It is under the presidency of S. C. Whitbread, Esq.

At the meeting of the council of this Society, held a few days since, I did myself the pleasure of reading the letter with which you have favored me, and it was resolved that a form for collecting observations, drawn up by myself, and now in the printer's hands, should be sent to you, and the council expressed a wish to co-operate with the Smithsonian Institution as far as possible. Hitherto, there has been no fund devoted to meteorology in England, and I have borne all the expenses, excepting that each gentleman has furnished himself with his instruments; government, however, has published the results in the reports of the Registrar General, some of which I send.

We hope now to collect much more information than I have hitherto done, and if the system adopted by you be similar to that adopted by us, their united results will be more valuable.

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Among the forms sent you will find one very simple, and which is used daily at about 50 different railway stations at the hour of 9 a.m., Greenwich time. The different railway companies have agreed that the station masters shall take these observations, and that they shall be brought to London the same day, free of expense. The proprietors of a London newspaper, the *Daily News*, incur the expense of sending a messenger to the several railway termini at about 2 a.m., and all the returns thus collected are immediately printed, so that the weather of the day previous, at one time, all over the country and parts of Scotland are publicly known. On receiving the paper I lay all these returns on a map, using a long, narrow-headed arrow to indicate the direction of the wind, and other symbols for the other information, and thus daily I know the weather, direction of the wind, etc., the whole being exhibited to the eye. Several gentlemen, whose names you will see in a form headed "Simultaneous observations taken at 9 a.m.," have agreed to co-operate with me, and to take all the observations taken by the railway station masters, as well as others, with their full sets of instruments. It is believed by these arrangements, that very important information, with respect to the passage of storms in particular, will thus be collected. I have already more than one year's observations and daily maps in an unbroken series.

Previous to commencing these observations I visited every station, determined its meridian, fixed a compass card, and instructed the station master, remaining with him till I felt certain he would take the observations well.

The method I have adopted with respect to the observations of general phenomena is first to superintend the making of the instruments, then their selection. I determine their index errors by carefully examining and comparing every instrument with a standard. I visit the different locations in which they are placed, and examine the positions of the instruments themselves.

On receiving the returns I first examine every one by itself; second, I divide them into groups, including the observations from one known good observer, and then I compare every result in every return with the corresponding result in the standard return, taking into account difference of elevation, etc.; next, I form groups according to latitude, and another according to the longitude, by these means I usually detect any errors, and I believe very few escape. After this I proceed to their combinations, etc.

The British Meteorological Society intends in future having monthly returns, including every observation, and for which a form is now being set up, I shall, therefore, be more certain of the accuracy of the results.

I should be glad to have some arrangements made with the captains of steam vessels between America and England, thus connecting the observations taken in both countries, and I think this may ultimately be done.

I have the honour to be, Sir, with much respect and esteem,

Yours very truly,

JAMES GLAISHER.

13, *Dartmouth Terrace, Blackheath, Kent, July 8th*, 1850.

The sudden advent of a forgotten document like this, naturally induces reference to previous statements respecting the matters therein mentioned. The first paper with which comparison has to

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be made is Mr. Symons's *History of English Meteorological Societies*;(1) in it no modification whatever is needed.

The next papers are, "*The first Daily Weather Map, sold in the Great Exhibition of* 1851;(2) "*The First Daily Weather Map*;(3) *Scientific Weather Forecasting.*(4) Here Mr. Glaisher's letter gives additional information, showing, as it does, that the first reports were not (as we supposed) telegraphed, but were sent by train. With that exception, there seems nothing in either article which requires modification; but perhaps it will tend to clearness if we state, in chronological order, the facts as regards the British Isles:—

1848.—In the latter part of this year, or the early part of 1849, Mr. Glaisher received from nearly all the railway companies a free pass over their lines. He provided himself with a supply of compass cards, and travelled over the country, teaching the railway clerks how to observe the weather. At the same time he visited many private observers and inspected their stations, because from the beginning of 1847 he had organized and contributed to the Registrar General's Reports the series of tables which he has continued to furnish for every subsequent quarter for fifty years!

With regard to this inspection of stations—Is there any record of its (1) proposal or (2) execution at an earlier date?

1849, June 14th.—First collection of reports from the railway termini by the *Daily News*, insertion in its issue of the weather table for the previous day at 13 stations, and preparation by Mr. Glaisher in MS. of the first current weather map.

1851.—Similar information collected by the Electric Telegraph Company, and on August 8th issue of the first printed Daily Weather Map.

1860, September 6th.—Issue, by Admiral FitzRoy, of first Daily Weather Report at the cost of the English Government.

1872, March 11th.—Issue of first Daily Weather Map at the cost of the English Government.

The letter is very remarkable considering its date—before Maury, and *a fortiori* before the Brussels Conference, or the appointment of FitzRoy, or Le Verrier's action in consequence of the Black Sea storm. One cannot help regretting that lack of funds prevented England from reaping the advantage of Mr. Glaisher's broad and correct views, and that we are therefore ten or twenty years behind where we might have been. But as regards Mr. Glaisher personally—the Nestor of meteorologists, as Prof. Abbe happily names him—it must be some little consolation to know that his early efforts are thoroughly appreciated on both sides of the Atlantic.

(1) *Quar. Jour.* [*Roy.*] *Met. Soc.*, Vol. VII. (1881), pp. 65–98.
(2) *Met. Mag.*, XXXI. (1896), p. 113.
(3) *Met. Mag.*, XXXII. (1897), p. 33.
(4) *Science Progress, N.S.*, I. (1896), p. 1.

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TRUE TIME.

WE have received, and reprint at once, the following circular. But for the signature, and for the fact that we can remember no table or book which gives the information desired, we should not have believed it possible that there was any difficulty in knowing, in London, what time was being indicated by the office clock of any telegraph station in the world. However, this information appears not to be forthcoming, and as Prof. Milne requires to be able to identify with certainty seismometric and telegraph cable disturbances all the world over, we are sure that his enquiry should receive all assistance possible. We are glad to hear that the Marquess of Salisbury has promised to forward some of the applications through the Foreign Office, so that they may receive proper attention. Possibly this revelation of ignorance may be one step onward towards the attainment of that evident *desideratum*, Universal Time.

BRITISH ASSOCIATION,
BURLINGTON HOUSE, LONDON, W.

SIR,—It is, I think, remarkable that there appears to be no publication which shows the corresponding value in Greenwich Mean Time, of the local time employed throughout the World.

Such a table is indispensable in order to determine accurately the instant of occurrence of earthquakes, sea waves, magnetic phenomena, the despatch of telegrams, and many other events, the sequence of which in absolute time has to be determined.

Although application has been made to the Royal Observatory at Greenwich, to the Royal Geographical Society, to the Central Telegraph Office in London, to the Offices of Cable Companies, and to other possible sources of information, very little has been obtained.

As a Secretary of the British Association Committee whose names are appended, I desire to publish in their forthcoming report a table showing the differences between Greenwich mean time as used in England and Scotland and that of the Civil Times used in various parts of the world.

By Civil Time I mean the time used by Railways, Telegraphs, and for ordinary public affairs.

If different times are used in various parts of your country, I trust that you will be able to give information relating to the same.

Feeling assured of the value of the table it is intended to compile, I sincerely trust that you will favour me with a full and explicit statement of the time generally employed in your country. If it is mean time, state the meridian; the observatory, or the place to which this refers; and also, as a check against any misunderstanding, please state distinctly the equivalent of December 1st, 9 a.m. G.M.T. in the local time, or times adopted in your own country.

I have the honour to remain, sir,
Your obedient servant,
JOHN MILNE.

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SEISMOLOGICAL INVESTIGATION COMMITTEE.

BRITISH ASSOCIATION.

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SUNLESS DAYS AND THE DAY-DISTRIBUTION OF SUNSHINE IN SUMMER.

How many sunless days have we in London in the year, the months, the seasons? I will try to answer this question, on the basis of twenty years' observations at Greenwich (1877-96).

By a "sunless day" is to be understood one giving no record in the Campbell-Stokes instrument, in which, as is known, a strip of millboard is charred by solar rays focussed by means of a glass globe.

The total of sunless days in those twenty years I find to be 1,849; giving an average of (say) 92 in a year. About one-fourth of our days are sunless. In winter, of course, there is a large preponderance. The monthly averages are as follows:

Jan.	17·9	April.....	3·7	July.....	1·7	Oct.	8·5
Feb.....	11·3	May.....	2·5	Aug.....	2·1	Nov.....	12·9
March	5·9	June.....	2·6	Sept.....	3·6	Dec.....	19·3

Thus, December has most, and July least. (It may here be noted that the month with most bright sunshine is May.) Spring has 12·1 sunless days; summer, 6·4; autumn, 25·0; winter, 48·5. In the series, summer, spring, autumn, winter, each of the last three has about twice as many sunless days as the season before it.

Consider next the numbers in years and half-years:—

	Sunless days in year.	Sunless days Apl.—Sep.	Sunless days Oct.—Mar.
1877.....	86	16	—
1878.....	84	7	67
1879.....	106	17	85
1880.....	78	14	67
1881.....	92	17	80
1882.....	84	9	69
1883.....	82	20	67
1884.....	92	18	71
1885.....	102	15	74
1886.....	104	19	93
1887.....	92	17	78
1888.....	98	23	83
1889.....	105	19	70
1890.....	97	14	81
1891.....	79	18	79
1892.....	98	14	71
1893.....	80	10	80
1894.....	97	27	64
1895.....	90	13	73
1896.....	103	22	86
Totals	1849	329	1438

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The year with most sunless days in this period is 1879, then follow 1889, 1886, 1896, &c. On the other hand, 1880 comes lowest, then 1891, 1893, &c. The most sunless summer half is 1894; the most sunless winter half, 1885-86.

Let us now restrict our attention to the five months May to September, and consider how the 153 days of this period are to be distributed in respect of bright sunshine. The total days in those 20 summer seasons (3,060) are arranged in grades differing by one hour's bright sunshine (0 to 1, 1 to 2, &c., each grade including the lower, but not the upper limiting value). Thus we have the following table:—

Hours Sunshine.	Days in May—Sep. in 20 yrs.	Average.	Hours Sunshine.	Days in May—Sep. in 20 yrs.	Average.
0—1	609	30·4	9—10	167	8·3
1—2	258	12·9	10—11	147	7·3
2—3	261	13·0	11—12	115	5·7
3—4	225	11·2	12—13	100	5·0
4—5	253	12·6	13—14	76	3·8
5—6	221	11·0	14—15	8	·4
6—7	233	11·6	15—16	1	—
7—8	204	10·2			
8—9	182	9·1	Total	3060	(say) 153

It will be seen that the grade 0 to 1 stands high above the others. About 20 per cent. of those days have sunshine less than one hour, or none. On the other hand, about 14 per cent. have 10 hours, or more. There are eight cases (in those 20 years) of 14 to 15 hours' sunshine, and there is one (in 1887) over 15.

A. B. M.

SO-CALLED SULPHUR-RAINS.

AMONG the superstitions engendered by ignorance of the laws of meteorology we must include the "showers of sulphur." Without absolutely denying that the wind may be able to carry to great distances real sulphur coming from volcanoes, it is certain that the majority of such showers are due to quite another cause. At Bordeaux the phenomenon of the so-called sulphur shower is quite frequent; it is seen every year in April and May, chiefly with fine rain and west winds. Objects are covered by this rain with a very fine yellow powder, which collects in hollow places. This powder has no odour and is impalpable; but if it be examined with the microscope it may be shown to consist of kidney-shaped bodies swelled at both extremities. The origin of this yellow powder is not doubtful. Bordeaux is encompassed toward the south and west by vast pine forests. At the period of flowering the pollen is carried by the wind up to the clouds, whence it falls with the rain. The special form of the corpuscles collected is absolutely identical with that of grains of vegetable pollen.—*Revue Scientific.*

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HIGH TEMPERATURE AT NIGHT, AUG. 4TH.

To the Editor of the Meteorological Magazine.

SIR,—Your *Met. Mag.* for September to hand. I can confirm the fact of the high night temperature. Here at the altitude of 1,148 ft., as in England, the highest minima occurred during the two nights of 4th to 6th of August: 4th-5th, 61°·4; 5th-6th, 61°·5.

They occur in the first decade of August, of which the daily mean temperature is 65°·8; whilst that of the third decade of July is 63°·7, and that of the second decade of August, 62°·6.

But these high minima fall far short of those of other years, as you may judge from my table of 12 years' observations:—

DATE.		Maximum of the day before.	Minimum.	Lowest Minimum in between.
		°	°	°
1886	July 20	87·1	66·4	46·9
	Aug. 30	74·5	66·4	
1887	July 30	85·5	66·2	48·0
	Aug. 6	83·7	65·7	
1888	July 22	73·8	60·8	46·0
	Aug. 10	80·8	69·6	
1889	July 10	83·1	63·0	46·9
	Aug. 4	76·1	59·7	
1890	July 31	80·1	64·6	50·9
	Aug. 9	77·2	61·0	
1891	July 17	72·3	58·6	46·4
	Aug. 14	71·1	60·1	
1892	July 30	80·4	61·3	45·7
	Aug. 17	90·9	72·1	
1893	July 20	77·4	61·5	46·4
	Aug. 16	83·1	68·4	
1894	July 23	81·7	65·1	46·9
	Aug. 24	72·7	62·6	
1895	July 25	78·1	66·6	48·7
	Aug. 21	81·0	66·2	
1896	July 20	76·1	62·1	45·3
	Aug. 15	71·2	54·7	
1897	July 24	74·5	59·7	50·7
	Aug. 5	81·7	61·5	

You will notice that the difference between the minimum and the maximum of the day before is very variable, from 20°·7 in July, 1886, to 8°·1 in August, 1886. I have even seen this difference to be only 1°·8 in the middle of summer: on August 23rd, 1894, the maximum was 62°·6, and the minimum of the next day, 60°·8.—Yours truly,

V. RAULIN.

Montfauçon (Meuse), Sept. 18th, 1897.

To the Editor of the Meteorological Magazine.

SIR,—Referring to the letter in your last issue by Mr. Sydney Wilson, and to your list of high minimum temperatures, I may add

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that the minimum reading on August 5th at Malvern, 500 ft. above sea level, was 68°·6. The maximum of the 4th being 83°·8. The minimum readings throughout the month were so high, that it brought the mean to within 1°·7 of that of July, although the latter month was upon the whole far hotter.—Yours faithfully,

C. S. PRINGLE.

Weston-super-Mare, 18th Sept., 1897.

A THERMO-HYGROGRAPH-CARRYING KITE 10,016 FT. ABOVE SEA LEVEL.

WE have not been able to keep our readers fully informed as to the progress of kite work in the United States. Suffice it now to say that Mr. A. Lawrence Rotch has invoked the aid of a small steam engine to wind in his kites, and has sent us the cutting which we reprint below; and we think that in so doing we ought to congratulate him on his success in the experiment; as to that of the prediction, we know nothing:—

"BLUE HILL OBSERVATORY, Sept. 19th.—All kite records were broken here this afternoon when the topmost kite of seven, all of the Hargrave type, on four miles of wire, attained an altitude of 10,016 feet above the sea level, or 9386 feet above the summit of the hill.

"The first kites were sent up about noon, and the greatest height was reached at 4.17 p.m., but several of the kites were in the air for an hour after sunset.

"The day was particularly favourable for the flight, the air being clear, while at the surface the wind blew in strong puffs from the south. As the kites rose, however, they ran into a more westerly current, until just after the last one was sent up, the highest was almost at right angles to the lowest, causing the wire to make a long sweeping curve to the eastward.

"As usual, an aluminium box containing an instrument for recording pressure, temperature and humidity, was swung 130 feet below the topmost kite. It remained higher than a mile during five hours.

"At the highest point the thermometer recorded a temperature of 38°, while at the same time it was 63° at the surface of the earth.

"At a height of 4000 feet the relative humidity rose rapidly, but sank again at a mile, where it was quite low. At 7000 feet it again rose, and soon reached a point where there was almost complete saturation of the air. From there upwards the atmosphere became drier, until at the highest point there was scarcely any moisture recorded. At the ground the relative humidity all the afternoon was quite low.

"The entire flight was made without a mishap, the kites going up easily, and, after getting above the southerly wind, remaining very steady.

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"It took the steam engine a little over two hours to reel in the four miles of wire, and the last kites reached the ground at 6.40 p.m.

"From observation obtained in the upper atmosphere it does not appear that any sudden change in the temperature is probable for a day or so, the decrease in the temperature with height being about the average."

TREES DAMAGED BY LIGHTNING.

DURING the TS in the N. of London on July 21st, a poplar in Clissold Park, Stoke Newington, was damaged in a rather unusual way. The tree, a large one, stood on the edge of a gravel walk; and a low (9 inch) rail of 1 inch iron, which divided the footpath from the adjoining grass (and which was supported for most of its length by dwarf iron posts) had been driven into the tree so as to support the extremity of the rail. There was, therefore, virtually a long horizontal conductor connected to earth at every 8 ft., ending in the tree. When the storm-cloud came near, there was an explosive discharge, *not* at the top of the tree, nor even at any of its branches, but from about six inches above where the rail entered, up to about 4 ft. 6 in. above the ground; there the outer rough bark was blown off for about 3 ft. high by 1 ft. broad; along the middle of this the inner soft bark had been grooved (as is often the case with poplars) and separated from the trunk of the tree. We did not see the tree for two days, and doubtless the edges had been touched, but we noticed one feature to which we desire to call special attention, so that others may see whether the fact we noticed is, or is not, exceptional. The frayed edges on one side of the groove were attached by their upper extremities, and those on the other side by their lower ones—not without exception, but probably six fragments out of seven followed this rule. Of course, this suggests the passage of two currents in opposite directions; we express no opinion, and make no assertions; we merely record what we saw, and ask all who see a tree which has been grooved by lightning, to examine the edges carefully, and report the result. It is, we think, not much use looking at oaks, as they seem to be generally burst asunder as by an internal explosion.

EXPERIMENTS TO DRIVE AWAY HAIL.

WE have heard often enough that loud and continued explosions produce rain, and the recollection of rain-making experiments based upon this apparent connection is still with us. Now comes a report from Mr. Germain, United States Consul at Zürich, on the prevention of hailstorms by the same means that have been used to encourage a downfall of rain. It appears that Mr. Albert Stiger, burgomaster of Windisch-Freistritz (Lower Steirmark, Austria), owns extensive vineyards situated on the southern slopes of the Bacher Mountains,

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a locality often visited by destructive hailstorms. To protect his vines from hail, he decided to try the shooting or explosive system to scatter the clouds and drive away approaching hail or heavy rain storms. Six stations were therefore erected on the six most prominent summits surrounding the locality, and commanding a territory of about two miles in extent. These stations sheltered ten heavy mortars each. Upon the slightest indication of a storm the mortars were immediately manned and loaded with 120 grams of powder each—about 4¼ ounces—and shooting commenced simultaneously and continued regularly out of the sixty mortars until the clouds were scattered and the storm had blown over. These experiments were anxiously watched by the citizens of Windisch-Freistritz last summer. Threatening black clouds made their appearance over the summits of the Bacher Mountains; at a given signal all the mortars were fired off, and the continuous detonations in a few moments caused a sudden reaction in the movements of the clouds. It is said that the clouds opened up funnel-like, the mouth of the funnel began to rise in the form of consecutive rings, expanding gradually until all of the cloud scattered and entirely disappeared. There was no hail, or even a sudden downpour of rain. The same experience was gone through six times during the summer, and proved a successful preventive in each case. We await the views of Austrian meteorologists upon these experiments; meanwhile, rainmakers who have put their trust in explosions must hide their diminished heads before the rain-dispersers.—*Nature.*

SAND STORM ON THE NILE.

MERAWI, *Sept. 22nd.*

THE great heat of the last ten days, due to the prevalence of the south wind, culminated yesterday in a great storm. All the morning the sky had been unsettled, and finally the clouds gathered, the air became perfectly still, and the birds ceased singing. The heat was intolerable, it was impossible to remain in one's tent, and many of the force sought relief by bathing their heads in water.

Suddenly, about three o'clock in the afternoon, two distinct dust walls were seen approaching, one from the south and one from the east. At the same time the wind began sighing in the trees. In five minutes it had increased to a hurricane, the two walls of sand united, and came on straight towards the middle of the camp. The noise resembled the sound of a big drum, and this, together with the rushing wind, produced a tremendous and awe-inspiring roar. The sand made a peculiar sound, like the rending of cloth. For half-an-hour the storm continued with unabated fury. By the end of that time the eyes, nostrils and mouths of all in camp were full of sand. Tents were blown down, and the river was lashed into furious waves. So suffocating were the clouds of sand that in many cases acute nausea ensued, while everyone suffered extreme discomfort.

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THE BRITISH ASSOCIATION AT TORONTO.

EVERYBODY has seen in the newspapers how heartily the British Association was welcomed in Britain beyond the Sea; we, therefore, need say nothing on that head.

As regards Meteorological papers and reports we have been favoured with some yards of newspaper cuttings, but we have not room to print them *in extenso*, and doubtless the important papers will be published in the volume of the Association, which we are glad to find is issued much more promptly than it used to be. In these circumstances, we think that the best plan is to quote the summary of the Meteorological work given by our American contemporary, *Science*.

In the meteorological department the following papers were read:—

John Hopkinson, "Monthly and Annual Rainfall at Ten Stations in the British Empire, 1877 to 1896." It appears doubtful, however, whether so limited a series of observations can be taken as representative of the pluviology of the Empire.

Dr. Van Rijckevorsel, on the "Temperature of Europe." From certain peculiar maxima and minima exhibited by the curves of daily temperature, he considers that the continent may be divided into two regions in which a different type of weather prevails.

Prof. R. F. Stupart (Director of the Meteorological Service of Canada), on the "Climatology of Canada."

F. Napier Denison on the "Great Lakes as a Sensitive Barometer." From a comparison of simultaneous records of changes of level in the Great Lakes and of smaller undulations in the atmospheric pressure by means of a sensitive barograph, the author concludes that the larger differences are due to difference of atmospheric pressure over the extremities of the lake, but may be greatly augmented by the action of the wind on the surface of the water. The smaller undulations appear to be due to atmospheric waves caused by currents in different strata travelling in opposite directions, as shown by Helmholtz.

Papers were also contributed by A. Lawrence Rotch and by Prof. Marvin, on the "Exploration of the Air by Kites," showing how it was possible, by means of recording instruments sent up to great elevations attached to a kite, to obtain information with regard to the temperature and hygrometric condition of the air, which would be of use in forecasting. It appears, however, that there is still much to be done in improving the recording hygrometer.

There seem to have been also the following other papers which (perhaps intentionally) the reporter for *Science* ignores; we add the titles without comment.

DR. J. EDKINS.—Slow Refrigeration of the Chinese Climate.

R. G. HALIBURTON.—November Meteors and November Flood Traditions.

DR. OTTO HUHN.—Meteorites, Solid and Gelatinous.

PROF. PERCIVAL LOWELL.—Atmosphere in its Effects on Astronomical Observation.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, APRIL, 1897.

STATIONS. (Those in italics are South of the Equator.)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	67·3	27	27·8	11	55·3	39·6	89·9	78	108·9	20·7	1·57	16	6·8
Malta	78·8	24	47·0	3	66·6	54·8	51·5	77	146·2	44·0	1·85	9	5·8
Mauritius	84·5	1	64·2	17	81·7	69·9	64·9	72	130·5	56·0	1·75	14	5·3
Calcutta	103·7	17	67·6	4	97·2	75·0	67·0	57	159·6	59·0	·83	4	2·7
Bombay	93·5	27	71·0	4	88·7	77·6	73·9	74	141·5	61·2	·00	0	2·0
Ceylon, Colombo	92·2	...	71·2	9	89·5	75·9	74·5	81	146·0	70·0	10·97	17	5·5
Melbourne	84·4	17	37·6	23	68·5	48·5	48·2	68	133·5	25·0	·64	7	5·0
Adelaide	90·9	4	44·7	29	74·5	54·4	48·0	57	146·0	34·7	·93	8	4·3
Sydney	88·0	12	50·8	22	74·6	59·8	54·7	71	137·8	40·6	6·66	9	3·7
Wellington	67·5	5	40·0	24	61·5	50·5	48·0	74	130·0	29·0	6·92	12	4·5
Auckland	75·0	14	45·0	19	67·3	53·4	50·2	69	138·0	42·0	2·12	9	4·3
Jamaica, Kingston	89·5	12	69·8	27	86·9	72·1	68·6	70	...	...	2·00	7	1·6
Trinidad	94·0	28*a*	65·0	11	90·3	68·7	68·6	70	169·0	63·0	·26	4	...
Grenada	86·4	22	71·0	22	84·5	74·6	72·6	83	150·6	...	2·06	13	0·9
Toronto	71·1	23	29·9	20	51·2	34·7	34·9	70	85·5	15·0	2·14	14	6·7
New Brunswick, Fredericton	70·8	25	11·7	20	49·9	28·5	30·3	65	...	...	2·67	13	6·5
Manitoba, Winnipeg	71·6	17	11·0	19	51·0	28·4	...	...	...	...	1·01	10	5·7
British Columbia, Esquimalt	70·7	15	32·2	2	56·6	40·6	45·6	83	...	...	1·04	11	5·6

a—and 29.

REMARKS.

MALTA.—Adopted mean temp. 59°·3, or 0°·3 below the average. Mean hourly velocity of wind 13·2 miles. T8S on 3rd and 10th; L on 5 days. J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0, of dew point 3°·3, and rainfall 3·47 in., below their respective averages. Mean hourly velocity of wind 12·8 miles, or 2·3 above average; extremes, 30·6 on 6th, and 1·9 on 4th; prevailing direction E.S.E. L and T on 27th. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 14 days. H. O. HARNARD.

Adelaide.—Mean temp. just the average of 40 years. This was another very dry month, the total rainfall being ·84 in. below the average. C. TODD, F.R.S.

Sydney.—Rainfall ·36 in. above, temp. 2°·3 above, and humidity 7·2 below, their respective averages. Mean temp. for the month the highest recorded since Sydney Observatory was built. H. C. RUSSELL, F.R.S.

Wellington.—Generally fine up to the 13th, with occasional showers. Wind N.W. and frequently strong. The wind changed to S.E. on night of 14th, followed by heavy rain and strong S.E. wind on 15th and 16th; 3·06 in. and 3·04 in. of rain being recorded on the 16th and 17th, causing floods. Remainder of month fine. Mean temp. 1°·0 below, and rainfall 3·39 in. above, their respective averages. R. B. GORE.

Auckland.—An unusually fine and calm month. Rainfall quite one inch below the average of 30 years; mean temperature slightly below the average. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—The rainfall throughout the island shows a marked excess, and nearly every station had falls much in excess of the average. J. F. BRENNAN.

TRINIDAD.—Rainfall 1·77 in. below the average of 30 years. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, SEPTEMBER, 1897.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	2·11	XI.	Rhayader, Nantgwillt ...	6·26
II.	Dorking, Abinger Hall .	2·61	,,	Lake Vyrnwy	4·90
,,	Birchington, Thor	2·01	,,	Corwen, Rhug	...
,,	Hailsham	3·82	,,	Criccieth, Talarvor	4·10
,,	Ryde, Thornbrough	2·42	,,	I. of Man, Douglas	5·44
,,	Emsworth, Redlands ...	2·74	XII.	Stoneykirk, Ardwell Ho.	4·50
,,	Alton, Ashdell	2·53	,,	New Galloway, Glenlee	4·58
III.	Oxford, Magdalen Col..	2·21	,,	Moniavie, Maxwelton Ho.	3·91
,,	Banbury, Bloxham	1·97	,,	Lilliesleaf, Riddell	2·84
,,	Northampton, Sedgebrook	2·16	XIII.	N. Esk Res. [Penicuick]	3·05
,,	Duddington [Stamford].	2·71	XIV.	Glasgow, Queen's Park..	3·39
,,	Alconbury	2·81	XV.	Inverary, Newtown	6·10
,,	Wisbech, Bank House...	3·48	,,	Oban, The Corran	...
IV.	Southend	2·54	,,	Islay, Gruinart School...	2·82
,,	Harlow, Sheering..... ...	3·50	XVI.	Dollar.....	3·47
,,	Colchester, Lexden	2·98	,,	Balquhidder, Stronvar...	5·49
,,	Rendlesham Hall	2·34	,,	Ballinluig	...
,,	Rushall Vicarage	3·69	,,	Dalnaspidal H.R.S.....	5·49
,,	Swaffham	4·03	XVII.	Keith H.R.S.....	3·46
V.	Salisbury, Alderbury ...	2·71	,,	Forres H.R.S.	1·99
,,	Bishop's Cannings	2·50	XVIII.	Fearn, Lower Pitkerrie..	1·16
,,	Blandford, Whatcombe .	2·96	,,	N. Uist, Loch Maddy ...	...
,,	Ashburton, Holne Vic...	4·77	,,	Invergarry	6·30
,,	Okehampton, Oaklands.	6·31	,,	Aviemore H.R.S.	2·91
,,	Hartland Abbey	5·15	,,	Loch Ness, Drumnadrochit	4·48
,,	Lynmouth, Glenthorne.	6·69	XIX.	Invershin	3·48
,,	Probus, Lamellyn	4·67	,,	Scourie	...
,,	Wellington, The Avenue	3·24	,,	Watten H.R.S.....	3·44
,,	Wincanton.....	4·12	XX.	Dunmanway, Coolkelure	4·45
VI.	Clifton, Pembroke Road	3·82	,,	Cork, Wellesley Terrace	2·02
,,	Ross, The Graig	2·60	,,	Killarney, Woodlawn ...	3·93
,,	Wem, Clive Vicarage ...	2·05	,,	Caher, Duneske	2·87
,,	Cheadle, The Heath Ho.	3·78	,,	Ballingarry, Hazelfort...	2·76
,,	Worcester, Diglis Lock	2·12	,,	Limerick, Kilcornan ...	3·14
,,	Coventry, Priory Row...	2·37	,,	Broadford, Hurdlestown	2·79
VII.	Grantham, Stainby	2·54	,,	Miltown Malbay	4·10
,,	Horncastle, Bucknall ...	2·43	XXI.	Gorey, Courtown House	2·50
,,	Worksop, Hodsck Priory	2·02	,,	Athlone, Twyford	2·03
VIII.	Neston, Hinderton	4·23	,,	Mullingar, Belvedere ...	2·54
,,	Southport, Hesketh Park	3·99	,,	Longford, Currygrane...	1·87
,,	Broughton-in-Furness ...	6·12	XXII.	Woodlawn	2·12
IX.	Ripon, Mickley.....	1·83	,,	Crossmolina, Enniscoe ..	3·02
,,	Melmerby, Baldersby ...	1·64	,,	Collooney, Markree Obs.	2·58
,,	Scarborough, Observat'y	3·09	,,	Ballinamore, Lawderdale	1·89
,,	Middleton, Mickleton ...	2·78	XXIII.	Warrenpoint.....	2·52
X.	Haltwhistle, Unthank...	...	,,	Seaforde.....	2·57
,,	Bamburgh	2·20	,,	Belfast, Springfield	2·92
,,	Keswick, The Bank.....	6·16	,,	Bushmills, Dundarave..	2·86
XI.	Llanfrechfa Grange	5·02	,,	Stewartstown	1·40
,,	Llandovery	4·99	,,	Killybegs	4·96
,,	Castle Malgwyn	4·81	,,	Lough Swilly, Carrablagh	4·14
,,	Builth, Abergwesyn Vic.	7·42			

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SEPTEMBER, 1897.

Div.	STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average. 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32°. In shade.	On grass.
		inches.	inches.	in.								
I.	ENGLAND. London (Camden Square) ...	2·75	+ ·24	·68	29	13	70·6	29	38·1	19	0	0
II.	Tenterden	2·43	— ·48	·55	29	16	70·0	26	37·0	19	0	...
,,	Strathfieldsaye	1·32	...	·45	1	11	...	...	...	...	...	...
III.	Hitchin	1·90	— ·60	·49	1	13	67·0	11*a*	36·0	9	0	...
,,	Winslow (Addington)	3·33	+ ·66	1·99	29	13	68·0	2*a*	33·0	19	0	1
IV.	Bury St. Edmunds (Westley)	2·93	+ ·23	·73	29	14	65·0	26	38·0	19	0	..
,,	Norwich (Brundall)	3·94	...	·92	18	16	69·0	2	39·0	4	0	0
V.	Weymouth(LangtonHerring)	...	...	...	...	...	...	...	...	...	...	...
,,	Torquay (Cary Green)	3·09	...	·84	8	15	66·5	21	42·0	19	0	0
,,	Polapit Tamar [Launceston]..	6·03	+ 2·32	1·38	8	20	68·5	14	36·8	12*e*	0	...
VI.	Stroud (Upfield)	2·69	— ·22	·77	29	14	67·0	15*b*	40·0	18	0	...
,,	ChurchStretton(Woolstaston)	2·49	— ·01	·48	5	17	68·0	28	38·0	10	0	1
,,	Tenbury (Orleton)	...	...	...	...	...	...	...	...	...	...	...
VII.	Leicester (Rotherby Hall) ...	2·35	...	·45	5	22	66·0	12*c*	34·0	19	0	7
,,	Boston	3·12	+ ·35	1·08	29	12	70·0	12	34·0	19	0	...
,,	Hesley Hall [Tickhill].....	1·99	— ·17	·49	1	13	69·0	24	36·0	9, 12	0	...
VIII.	Manchester(PlymouthGrove)	4·01	+ ·54	·91	2	12	69·0	27	34·0	9, 18	0	3
IX.	Wetherby (Ribston Hall) ...	2·65	+ ·19	·45	1	14	...	...	...	...	...	...
,,	Skipton (Arncliffe)	6·42	+ 1·66	1·22	1	18	...	...	...	...	...	...
,,	Hull (Pearson Park).....	3·21	+ ·77	·67	29	14	69·0	24	35·0	9	0	...
X.	Newcastle (Town Moor)	2·75	— ·03	·80	1	13	...	...	...	...	...	...
,,	Borrowdale (Seathwaite).....	11·99	+ ·26	3·42	23	18	...	...	...	...	...	...
XI.	WALES. Cardiff (Ely).....	5·91	+ 2·17	1·37	29	13	...	...	...	...	...	...
,,	Haverfordwest	5·09	+ ·69	1·04	1	20	66·9	12	36·2	12	0	3
,,	Aberystwith (Gogerddan) ...	7·20	+ 2·93	1·25	4	19	67·0	27	28·0	9*f*	...	...
,,	Llandudno.....	3·62	+ 1·40	1·00	1	17	66·2	14	39·0	10	0	...
XII.	SCOTLAND. Cargen [Dumfries]	3·40	— ·16	·66	1	16	71·6	13	34·0	9	0	...
XIII.	Edinburgh (Blacket Place)...	1·64	...	·33	1	20	69·1	13	38·0	18*e*	0	0
XIV.	Colmonell	3·90	...	·90	1	17	72·0	13	30·0	9	...	...
XV.	Lochgilphead (Kilmory).....	6·30	+ 1·17	·90	16	19	...	...	35·0	7	0	...
,,	Mull (Quinish).....	5·84	+ ·81	1·18	3	22	...	...	...	...	...	...
XVI.	Loch Leven Sluices	3·00	+ ·21	·70	2	15	...	...	...	...	...	..
,,	Dundee (Eastern Necropolis)	1·25	— 1·26	·25	1	17	70·4	12	35·3	7	0	...
XVII.	Braemar	1·78	— 1·08	·44	1	21	64·2	13	28·5	8	3	15
,,	Aberdeen (Cranford)	1·52	...	·43	29	22	71·0	12*d*	32·0	3	1	...
,,	Cawdor (Budgate)	2·49	— ·26	·39	1	25	...	...	...	...	...	...
XVIII	Strathconan [Beauly]	5·42	+ 1·74	1·94	27	12	...	...	...	...	...	...
,,	Glencarron Lodge.....	11·21	...	2·15	25	24	64·2	13	33·6	9	0	...
XIX.	Dunrobin	...	...	...	...	...	...	...	...	...	...	...
,,	S. Ronaldsay (Roeberry).....	5·99	+ 3·33	2·25	29	24	60·0	14	41·0	17	0	...
XX.	IRELAND. Darrynane Abbey.....	2·99	...	·90	7	18	...	...	...	...	...	...
,,	Waterford (Brook Lodge) ...	3·29	+ ·37	1·43	1	12	72·0	14	37·0	12	0	...
,,	O'Briensbridge (Ross)	3·31	...	·49	4	16	...	...	...	...	...	...
XXI.	Carlow (Browne's Hill)	3·19	+ ·37	1·24	1	17	...	...	...	...	...	...
,,	Dublin (FitzWilliam Square)	2·58	+ ·61	1·17	1	16	67·7	23	40·9	18	0	0
XXII.	Ballinasloe	2·15	— ·64	·56	4	18	65·0	13*d*	38·0	12	0	...
,,	Clifden (Kylemore)	5·44	...	1·56	4	18	...	...	...	...	..	...
XXIII	Waringstown	2·21	— ·95	·61	1	15	73·0	13	34·0	9	0	7
,,	Londonderry (Creggan Res.).	2·60	— 1·18	·30	4	24	...	...	...	...	...	...
,,	Omagh (Edenfel)	2·27	— 1·11	·47	5	21	66·0	13	35·0	9	0	...

+ Shows that the fall was above the average; — that it was below it.

a—and 13, 26. *b*—and 27. *c*—and 26, 27. *d*—and 14. *e*—and 19. *f*—and 10, 11, 18.

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METEOROLOGICAL NOTES ON SEPTEMBER, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—The 1st and 5th were rough and wet, and the 2nd, 4th, 19th, 23rd and 24th were also windy. Fine weather prevailed in the middle of the month and there were two or three lovely days towards the end. Duration of sunshine 140 hours. T on 17th; TS at night on 29th.

ADDINGTON.—A good deal of very fine weather during the month. Rather wet until the 5th, after that date very little R until the evening of the 29th, when a very heavy storm of R, T, and L occurred, 1·99 in. of R falling, mostly between 4 p.m. and 8.30 p.m. For a long time the lightning was almost continuous in the S.E. On 30th, the brook overflowed the meadows. A slight frost on the 19th blackened a few tender things in low situations. Fogs on 27th and 30th.

BURY ST. EDMUNDS, WESTLEY.—A month of the usual September weather. Cold days from 17th to 20th, the max. temp. on 19th being only 49°. Heavy TS at night on 29th, with incessant L, and very high wind.

NORWICH, BRUNDALL.—Mean temp. 2° below, and R 1·28 in. above, the average, and ·31 in. in excess of September, 1896, but the number of rainy days was 16 against 21 in the previous year. S.W. gale on 2nd. L on 3rd and 29th. TS and H showers on 4th. T and L on 6th, T, L, and heavy R on 29th.

TORQUAY, CARY GREEN.—Rainfall ·70 in. above the average. Mean temp. 56°·1, or 1°·9 below the average. Duration of sunshine 156 hours 35 minutes, being 1 hour 15 minutes above the average; four sunless days.

POLAPIT TAMAR.—A very wet month, especially the first eight days; the first few days were also rather stormy. The middle and latter portions of the month were generally calm and fine. The total rainfall for the first nine months of the year exceeds the whole fall for the year 1896. T and H on 3rd.

WOOLSTASTON.—The early part of the month was cold and wet, the latter part warmer and more genial. Mean temp. 54°·9. Vivid L on 29th.

ROTHERBY HALL.—The weather during the month was mild, with a fair amount of sunshine, the R falling chiefly in the night. The little frost (the thermometer on the grass falling once to 23°) did only slight damage to the gardens. The rainfall was ·24 in. below the average for ten years, 1880-89. Mean. temp. in shade 52°.

HULL, PEARSON PARK.—TSS on 1st and 6th.

SEATHWAITE.—On 23rd and 24th, 4·86 in. of R fell, causing a flood on the latter date.

WALES.

HAVERFORDWEST.—There were 20 wet days this September, but it was neither so wet nor so stormy as last year, although during the first six days strong winds prevailed with low pressure, and much R. Between the 9th and 18th there was fine bright weather, with a great fall of night temp. from the 10th to the 13th, the grass readings on three nights being below 32°. The unusual number of rainy days seriously interfered with the late harvest, and it is feared that much corn has been spoiled.

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SCOTLAND.

CARGEN [DUMFRIES].—A cold, although on the whole not ungenial month. Barometrical pressure and hours of sunshine are both slightly above the average for 38 years. The mean temp. is 1°·9 below that average. In the first six days 1·84 in. of R fell, considerably more than half the total for the month. Seven exceptionally fine days, 7th—13th, were followed by broken weather during the remainder of the month, and although R was recorded on ten out of the remaining seventeen days, no heavy fall (except ·46 in. on 23rd) occurred, and sharp breezes, chiefly westerly, prevented very serious interference with harvest operations, which, except in the higher districts, were concluded before the end of the month. The grain crop proved fairly satisfactory.

COLMONELL.—R ·12 in. below, and mean temp. 1°·3 above, the average of 21 years.

ABERDEEN, CRANFORD.—A warm month, with light winds.

S. RONALDSAY, ROEBERRY.—A wet month. Mean temp. 50°·5, or 1°·1 below the average of 7 years.

IRELAND.

WATERFORD, BROOK LODGE.—Dense fog on 11th, thick fog on 15th, and fogs on 12th and 13th. T in the afternoon on 30th.

O'BRIENSBRIDGE, ROSS.—Moderate R and a fortnight of bright weather.

DUBLIN, FITZWILLIAM SQUARE.—The month began badly, but proved favourable after the first few days, which were cold and wet. The mean temp. 54°·5 is 1°·3 below the average. High winds were noted on 11 days, but attained the force of a gale only on the 23rd. The atmosphere was foggy on 6 days. H fell on 3 days. A solar halo was seen on the 7th.

WARINGSTOWN.—An unusual difference was observed between the minima in shade, and on grass, amounting on the night of the 7th, 8th, 10th, 11th, and 18th, to 10°, while on the night of the 9th the shade min. was 34°, and the grass min. 25°. French beans, and some other plants were injured, but dahlias and heliotrope did not suffer.

EDENFEL.—The weather of September, although on the whole fickle and uncertain, tended to retrieve the disaster that impended over the harvest generally, and it would be impossible to over estimate the value to the country of the fineness of the second and part of the last week. As a result an average crop of cereals was saved in fair order, and the deficiency of potatoes—very serious in some localities—has been to some extent compensated for by the abundance of other green crops and grass. Orchard fruit is the worst crop remembered.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXII.] NOVEMBER, 1897. [PRICE FOURPENCE, or 5s. per ann. post free.

THE RAINFALL OF OCTOBER, 1897.

THE rainfall of October, 1897, has been so exceptionally small that we feel justified in devoting a considerable amount of space to a discussion of the details.

In table I. we have tabulated all records received up to date which show a total fall for the month of less than an inch. These number 61 out of a total of rather under 240, or fully one-quarter.

It will at once be seen that these stations are distributed over the S., S.E., E., and N.E. of England, stretching west as far as Torquay, and northwards to the borders of Yorkshire. Of course the adoption of an arbitrary limit of an inch is open to the objection that it does not represent a uniform ratio to the average, but on the other hand it represents a uniform quantity of water for the supply of springs and streams.

The main results of the table will perhaps be most readily grasped by summing the values for the different counties, as follows :—

					in.
Middlesex	5	stations	giving	a mean of	·73
Surrey	4	,,	,,	,,	·60
Kent	11	,,	,,	,,	·32
Sussex	10	,,	,,	,,	·34
Hants	6	,,	,,	,,	·49
Berks	1	,,	,,	,,	·70
Herts	3	,,	,,	,,	·69
Essex	5	,,	,,	,,	·51
Suffolk	3	,,	,,	,,	·59
Norfolk	5	,,	,,	,,	·88
Devon	1	,,	,,	,,	·94
Lincoln	3	,,	,,	,,	·82
Notts	2	,,	,,	,,	·98
Derby	2	,,	,,	,,	·96

It must be borne in mind that these figures do not represent the mean rainfall of the month over the different counties, but they probably indicate very fairly the relative intensity of the drought, and accepting the results we find the lowest values for the seaboard counties in the extreme S.E., Kent ·32 in., Sussex ·34 in., Hants ·49 in., Essex ·51 in., Suffolk ·59 in., while Surrey ·60 in. is much above the adjoining coast counties. Similarly Lincoln ·82 in. gives a lower value than Notts ·98 in., and Derby ·96 in., inland.

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TABLE I.—*October Rainfalls of less than an inch.*

STATIONS.	October, 1897.	Previous driest October.		Duration of Record.	Other Octobers with less than 1·00 in.	
		Amount	Year.		Amount	Year.
	in.	in.		years.	in.	
I. London, Camden Square	·56	·80	1879	40	·99	1884
,, Willesden Green, Strode Road	·76	...	...	3		
,, Muswell Hill	·74	·77	1879	26		
,, Finchley, Etchingham Park	·69	1·24	1888	13		
,, Uxbridge, Harefield Park	·91	...	...	7		
II. Abinger Hall	·72	·85	1879	19		
,, Farnham, Great Down Seale	·58	...	...	8		
,, Reigate, Woodhatch Lodge	·52	1·08	1890	18		
,, Wallington	·58	1·16	1890	14		
,, Tenterden	·24	·82	1879	34		
,, Hythe	·33	·68	1866	33		
,, Folkestone, Cheriton Road	·22	...	...	6		
,, Tunbridge Wells, Camden Park	·32	1·40	1884	14		
,, Seven Oaks, Riverhead Vicarage	·24	·58	1884	33		
,, Birchington, Thor	·28	...	...	6		
,, Sheppey, Leysdown	·20	1·24	1890	13		
,, Bickley, Elmhurst	·41	..	...	1		
,, ,, The High Field	·37	1·04	1879	20		
,, Bromley, Widmore Road	·45	...	...	2		
,, Chislehurst, Southlaund	·44	...	...	4		
,, Chichester, Westgate	·50	·92	1879	66		
,, Steyning	·48	1·35	1890	30		
,, St. Leonard's, The Grove	·07	1·12	1879	21		
,, Hailsham	·30	·88	1879	25		
,, Isfield Place	·29	...	...	2		
,, Uckfield	·38	·77	1879	56		
,, Lindfield, Wood Knoll	·39	...	...	4		
,, Crowborough, The Observatory	·36	1·08	1879	27		
,, East Grinstead, Felbridge Place	·40	...	...	3		
,, Ticehurst	·20	1·19	1890	15		
,, Ryde, Thornbrough	·44	1·24	1890	16		
,, ,, St. John's Park	·43	..	...	5		
,, Emsworth, Redlands	·54	·99	1884	14		
,, Liss, Lingwood	·64	...	...	6		
,, Alton, Ashdell	·76	·86	1884	32		
,, Strathfieldsaye Gardens	·11	...	...	3		
,, Wantage, Letcombe Regis	·70	1·04	1879	21		
III. Broxbourne, Stafford House	·60	1·12	1884	18		
,, Great Berkhampstead, Rosebank	·86	1·15	1888	13		
,, Hitchin, Wratten	·62	·61	1879	48	·92 ·81 ·97 ·80	1861 1871 1876 1888
IV. Southend Water Works	·15	·89	1890	17		
,, Manor Park, Albany Road	·42	...	...	7		
,, Harlow, Sheering	·77	·85	1879	34	·96	1871
,, Colchester, Hill House, Lexden	·48	...	..	9		
,, Saffron Walden, Newport	·71	·64	1879	22	·95	1888
,, Ipswich, Bishop's Hill	·47	·67	1879	26	·96	1888
,, Rendlesham Hall	·46	·55	1879	19	·78	1888

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TABLE I.—*October Rainfalls of less than an inch (continued).*

STATIONS.	October, 1897.	Previous driest October.		Duration of Record.	Other Octobers with less than 1·00 in.	
		Amount	Years.		Amount	Year.
	in.	in.		years.	in.	
IV. Bury St. Edmunds, Westley	·85	·36	1866	41	·53	1861
					·95	1871
					·81	1876
,, Harleston, Rushall Vicarage	·69	·91	1879	24	·98	1879
,, Wymondham	·91	..	...	9		
,, Denver	·88	·55	1888	13		
,, Norwich, Brundall.....	·94	...	...	5		
,, Swaffham.....	·99	1·00	1888	20		
V. Torquay, Cary Green.....	·94	...	...	6		
VII. Grantham, Stainby.....	·84	..	...	9		
,, Boston	·91	·48	1888	31	·71	1879
					·85	1890
,, Horncastle, Hemingby	·70	·67	1888	17		
,, Worksop, Hodsock Priory	·97	·64	1888	23	·84	1879
					·96	1879
,, Hesley Hall [Tickhill]	·99	·54	1888	23	·94	1884
					·86	1890
,, Derby, Midland Railway	·97	·60	1888	15		
,, Duffield.....	·95	...	...	3		

TABLE II.—*Rainfall of October*, 1897, *compared with that of the previous 25 or more Octobers.*

DIVISION AND STATION.	1897.	Average.		1897 Per cent. of average.	Number of previous Octobers with less than	
		Amount.	Years.		1·00 in.	1897.
	in.	in.				
I. Camden Square ...	·56	2·71	40	21	2	0
,, Muswell Hill	·74	3·06	26	24	1	0
II. Tenterden	·24	3·58	34	7	1	0
,, Hythe	·33	4·19	33	8	1	0
,, Seven Oaks	·24	3·52	33	7	1	0
,, Chichester	·50	3·65	44	14	1	0
,, Steyning	·48	4·26	30	11	0	0
,, Hailsham.....	·30	4·06	25	7	1	0
,, Uckfield	·38	4·00	56	9	1	0
,, Crowborough	·36	4·38	27	8	0	0
,, Alton	·76	3·71	32	21	1	0
III. Hitchin.....	·62	2·69	48	23	5	1
IV. Sheering	·77	2·71	34	28	2	0
,, Ipswich.....	·47	2·70	26	17	2	0
,, Westley	·85	2·63	41	32	5	3
VII. Boston	·91	2·57	31	36	3	3
MEAN.....	·53	3·40	35	16	1·7	0·4

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TABLE III.—*Relation of the Rainfall of October*, 1897, *to the average*, 1880-89.

STATIONS.	1897.	Per cent. of average 1880-89.	STATIONS.	1897.	Per cent. of average 1880-89.
	in.			in.	
Middlesex—			*Cornwall*—		
Camden Square	·56	19	Probus	1·69	31
Muswell Hill	·74	24	Polapit Tamar	1·50	30
Surrey—			*Gloucester*—		
Abinger Hall	·72	19	Clifton	1·22	34
Reigate	·52	15	Lechlade	1·39	51
Kent—			Stroud	1·56	51
Tenterden	·24	6	Cheltenham	1·48	50
Hythe	·33	7	*Hereford*—		
Sevenoaks	·24	7	Ross	1·84	56
Sussex—			*Shropshire*—		
Chichester	·50	15	Woolstaston	1·10	29
Steyning	·48	11	*Stafford*—		
St. Leonards	·07	2	Cheadle	1·11	32
Hailsham	·30	7	*Worcester*—		
Hants—			Diglis Lock	1·72	61
Ryde	·44	11	Lincombe Lock	1·19	41
Alton	·76	21	*Warwick*—		
Herts—			Coventry	1·81	57
Kensworth	·89	26	*Leicester*—		
Hitchin	·62	20	Rotherby Hall	1·36	44
Buckinghamshire—			*Lincoln*—		
Addington	1·24	40	Boston	·91	29
Oxford—			Bucknall	·70	22
Oxford	1·32	47	*Notts*—		
Banbury	1·64	54	Hodsock Priory	·97	31
Northampton—			Hesley Hall	·99	32
Castle Ashby	1·43	47	*Derby*—		
Sedgebrook	1·41	46	Derby	·97	29
Cambridge—			*Cheshire*—		
Wisbech	1·12	35	Hinderton	1·39	42
Essex—			*Lancashire*—		
Sheering	·77	26	Manchester	1·76	52
Newport	·71	23	Southport	1·87	53
Suffolk—			*York*—		
Ipswich	·47	15	Ribston Hall	1·57	50
Rendlesham	·46	14	Arncliffe	2·97	49
Bury St. Edmunds	·85	26	Ripon	1·72	46
Norfolk—			Hull	1·37	37
Rushall Vicarage	·69	19	*Northumberland*—		
Swaffham	·99	29	Unthank Hall	1·72	48
Wilts—			Newcastle	1·22	39
Alderbury	1·56	48	*Cumberland*—		
Bishops Cannings	1·46	45	Seathwaite	8·72	82
Mildenhall	1·59	49	Keswick	4·34	78
Swindon	1·47	47	*Wales (inc. Monmouth)*—		
Dorset—			Llanfrechfa	1·72	41
Blandford	1·44	34	Cardiff, Ely	1·91	42
Devon—			Llandovery	2·18	44
Holne Vicarage	2·33	33	Haverfordwest	1·96	38
Druid House	2·28	36	Gogerddan	1·81	34
Oakhampton	1·63	28	Nantgwillt	2·17	33
Barnstaple	1·39	27	Llandudno	1·46	43
Lynmouth	1·06	18			

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Of the 61 stations included in the table, no fewer than 40 have records extending over periods ranging between ten and sixty years, which gives good evidence for determining how far the returns for 1897 are unparalleled. Of these 40 stations, 31 show a wholly unprecedented value for October, 1897; while the remaining 9 stations show between them 17 precedents distributed over the following years :—

	1861.	1866.	1876.	1879.	1884.	1888.	1890.
	in.	in.	in.	in.	in.	in.	in.
III. Hitchin	...	...	...	·61	...	...	...
IV. Newport	...	...	...	·64	...	...	...
,, Westley	·53	·36	·81	...	...	...	...
,, Denver	...	...	...	...	...	·55	...
VII. Boston	...	...	...	·71	...	·48	·85
,, Hemingby	...	...	...	...	...	·67	...
,, Hodsock	...	...	...	·84	...	·64	...
,, Hesley	...	...	...	·96	·94	·54	·86
,, Derby	...	...	...	...	...	·60	...
Instances each year	1	1	1	5	1	6	2

Eleven out of these 17 precedents come from Div. VII., where the 1897 fall for the 9 stations in table I. averages ·90 in., and where obviously the drought was not intense. On the other hand, the following 9 long records show no October fall smaller than that of 1897.

I. Camden Square	40 years.	II. Steyning	30 years.
II. Tenterden	34 ,,	,, Uckfield	56 ,,
,, Hythe	33 ,,	,, Alton	32 ,,
,, Seven Oaks	33 ,,	IV. Sheering	34 ,,
,, Chichester	66 ,,		

The latter columns of the table show the driest October previously recorded at each station, the period over which each record extends, and all other Octobers in which the fall was less than an inch. These give one of the strongest illustrations of the very exceptional character of the drought, for while there are 27 entries below ·50 in. for October, 1897, there are only two instances for all the other Octobers in the table numbering, wet and dry included, nearly 1,000. Namely, ·36 in. at Bury St. Edmunds in 1866, and ·48 in. at Boston in 1888. It should be mentioned that to avoid burdening the table with unimportant figures the "previous driest" is not given for stations at which the record does not extend over ten years.

Table II. gives a summary of the results for stations at which the records extend over 25 or more years, and in addition the percentage which October, 1897, bears to the average of the whole period, the number of instances of less than an inch of rain in October at each station, and the instances of any other October drier than 1897. It shows that at six stations the 1897 fall is less than 10 per cent. of

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the average; and at only three is above 25 per cent. The Kent stations average 7 per cent., and the Sussex stations average 10 per cent.

At only three stations out of the sixteen has the fall been less in any other October than in that of 1897, viz.:—

		in.		in.
Hitchin.....	October, 1897	·62	excelled in 48 years by	·61 in 1879
Westley.....	,, ,,	·85	,, ,, 41 ,, ,,	·53 ,, 1861 ·36 ,, 1866 ·81 ,, 1876
Boston	,, ,,	·91	,, ,, 31 ,, ,,	·71 ,, 1879 ·48 ,, 1888 ·85 ,, 1890

At the first of these stations, Hitchin, in a period of nearly half-a-century, the 1897 fall has been once—shall we say equalled—while at the other two, Westley, near Bury St. Edmunds, and Boston, the 1897 falls are decidedly large, so that the amounts for the six Octobers with smaller falls are not so remarkable as dozens of the 1897 returns, only two of them being below half-an-inch. It would perhaps be difficult to justify the line of means at the bottom of table II., but it is a ready method of getting a gross value, and according to it the 1897 falls average 16 per cent. of the mean of 35 years, and the October fall will be less than an inch once in 21 years, while the 1897 value averages just over half-an-inch.

Table III. gives for 72 stations in England and Wales the rainfall of October, 1897, expressed as a percentage of the average for the month during the ten years 1880-89. It, like table I., emphasizes the fact that the deficiency was greatest in the extreme S.E., and greater on the S. and E. coasts than inland.

Taking the average of the records for each county, Kent heads the list with only 7 per cent. of the average, and Sussex follows with 9 per cent. Hampshire, Surrey and Suffolk show 16, 17 and 18 per cent. respectively. Middlesex 22, Herts 23, Essex 24, and Norfolk 24, complete the list of counties with less than a quarter of the average. Less than one third of the average fall is indicated for Lincoln 26 per cent., Devon 28, Shropshire 29, Derby 29, Cornwall 30, Stafford 32, and Nottingham 32. The counties recording from one-third to half the average are Dorset 34 per cent., Cambridge 35, Bucks 40, Cheshire 42, Leicester 44, Northumberland 44, York 45, Northampton 47, Wilts 47, Gloucester 47, and Oxford 50. Hereford, Worcester, Warwick, and Lancashire show values of from 50 to 60 per cent., while Cumberland foots the list with 80 per cent. A larger number of stations in each county would probably modify to some extent the foregoing values, but if they are plotted on a map it will be seen that they are much more accordant than might reasonably have been expected.

The Welsh stations give remarkably uniform results, ranging only from 33 per cent. of the average at Nantgwillt, Radnorshire, to 44 per cent. at Llandovery, Carmarthenshire, the average for all the stations in the Principality being 39 per cent.

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The general distribution over the country will perhaps be most readily indicated by grouping the stations under the divisions used in *British Rainfall*, when we get the following results.

Division	I.	Middlesex	22	per cent.	of the	average	1880–89
,,	II.	South Eastern Counties....	11	,,	,,	,,	,,
,,	III.	South Midland ,, ...	39	,,	,,	,,	,,
,,	IV.	Eastern Counties.....	22	,,	,,	,,	,,
,,	V.	South Western Counties...	36	,,	,,	,,	,,
,,	VI.	West Midland ,, ...	46	,,	,,	,,	,,
,,	VII.	North ,, ,, ...	31	,,	,,	,,	,,
,,	VIII.	,, Western ,, ...	49	,,	,,	,,	,,
,,	IX.	Yorkshire	45	,,	,,	,,	,,
,,	X.	Northern Counties.....	62	,,	,,	,,	,,
,,	XI.	Monmouth and Wales.....	39	,,	,,	,,	,,

Again very accordant values, lowest in the S.E., very small in the E., small along the S., S.W., and N.E. coasts, and increasing N. Westwards, but with rather unduly high values for the west midland counties.

The rapid increase of the 1897 fall, with increased distance from the sea coast already referreed to, is very marked, and is well exhibited by the following :—

Coast Stations.			Inland Stations.	
County.	Station.	Per cent. of aver.	Station.	Per cent. of aver.
Hants.....	Ryde.....	11	Alton	21
Suffolk	Rendlesham....	14	Bury St. Edmunds.	26
Devon	Lynmouth.....	18	Oakhampton.....	28
Gloucester	Clifton.....	34	Lechlade.....	51
York.....	Hull.....	37	Arncliffe	49
Northumberland..	Newcastle.....	39	Unthank Hall	48

In Sussex the difference between Coast and Inland stations is marked by the rapid increase from E. to W.

AUSTRIAN HYDROGRAPHY.*

It is a very strong and remarkable statement to make, but, to the best of our belief, it is true, that no Government Department ever started so nearly perfect an organization as that presided over by K. K. Oberbaurath Ernst Lauda.

Generally, early publications are more or less of an experimental character; and it is by degrees only that completeness is reached; but Herr Lauda's first volume will rank with, if not surpass, anything that we have ever seen for any country in the world. As for England, we have absolutely nothing to put beside these splendid Austrian volumes.

* Jahrbuch der K. K. hydrographischen Central-Bureau Jahrgang I.–III., 1893–95. Braumüller, Wien, 1895–97. 3 vols., large 4to, 562, 552, 1330 pages and numerous maps.

Beiträge zur Hydrographie Osterreichs 4to 68 pages, and atlas on the scale of $\frac{1}{750,000}$ (about 12 miles to an inch).

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The last being by far the largest of the three annual volumes, and of course giving the latest details as to the organization, we will base our remarks upon it. It consists of fifteen parts issued in a portfolio. The first part is a general introduction, with a map (about 2 ft. by 1½ ft.) on the scale of 35 miles to an inch of the principal river basins, showing also isohyetal lines for each 200 mm. (8 inches) of annual rainfall in the year 1895. It deals exclusively with details of the organization, and gives lists of the localities at which the observations are made. There are 2261 rainfall stations, and 28 additional ones for recording the depth of snow; and there are 872 stations at which the level of the water in the rivers and streams is measured daily.

Parts I. to XIV. deal with the several principal watersheds. Each part is alike in treatment, and, as it might be imagined that Part I.—Das Donau-Gebeit (The Watershed of the Danube)—was exceptionally good, we take Part IV.—Das Drau-Gebiet, or, as Englishmen would call it "The Watershed of the Drave." [*Why* it is not the rule for all countries to accept the local orthography of place-names we know not. To us it seems very absurd to write Vienna when we mean Wien, or Londres when we mean London; but it will be put right some day.]

This Part (IV.) deals with an area of about 12,000 square miles (about twice the size of Wales) which is roughly accordant with the district of Carinthia, has the Carnic Alps for its S.W. boundary, and the towns of Klagenfurt and Graz near its centre.

In this area there are 111 rain gauge stations at the following altitudes above sea level :—

14	between	656	and 1312 ft.	14	between	3281	and 3937 ft.
27	,,	1312	,, 1969 ,,	7	,,	3937	,, 4593 ,,
27	,,	1969	,, 2625 ,,	4	,,	4593	,, 4921 ,,
16	,,	2625	,, 3281 ,,	2	,,	5906	,, 7218 ,,

The level of the water in the rivers was observed at 74 stations; temperature of water and of air at a few of them.

First in the part comes a list of the stations, with the latitude, longtitude, and altitude of each, and the observer's name and profession (mostly clergy or schoolmasters); then follow tables of the daily rainfall at each station, and various analyses, and a carefully prepared summary of them. The wettest station is Raibl (lat. 46° 30°, long. 13° 35 E., altitude 2461 ft.), where the total in 1895 was 90·83 in., which was about 5 inches above its average; but the most remarkable feature was the rain at that station on October 8th and 9th, 1895, viz., 5·91 and 7·37 (*i.e.*, 13·28 inches in two days). The editor throws no doubt upon the record, and we see that at many drier stations the fall was between 5 and 7 inches.

Of course, on turning to the latter portion of the work, where the daily height of the water in the rivers is given, we expected to find this enormous rainfall produce a marked effect; and so we do, rises of 5 to 10 ft. being reported at most stations.

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These water levels are given in the same detail as the rainfall, and we are glad to note that many of the observers did not content themselves with their usual daily observation on the day of the flood (generally October 10th), but took extra readings so as to obtain the true maximum.

Lastly we must mention the exquisitely beautiful large-scale shaded rainfall map given in each part.

Although it occurs in another section (Part. IX.), we ought not to omit to mention the enormous rainfall in some parts of Dalmatia; we therefore give it in tabular form.

Place	Crkvice.	Jankov vrh.	Sa. Croce.	Goli vrh.	Jablanica gornja.
Latitude N.	42° 34′	42° 35′	42° 29′	42° 32′	43° 40′
Longtitude E. of Gr.	18° 38′	18° 40′	18° 42′	18° 44′	17° 46′
Altitude	3599 ft.	3343 ft.	558 ft.	4301 ft.	630 ft.
	in.	in.	in.	in.	in.
1895, January	52·09	16·42	16·50	8·35	15·75
February	36·93	21·58	16·38	14·69	10·55
March	17·05	16·73	10·16	6·61	10·35
April	13·82	17·60	11·38	13·15	8·94
May	11·54	15·35	5·63	4·84	7·01
June	3·74	3·78	*(5·59)*	6·06	1·85
July	4·17	4·10	3·58	4·17	3·39
August	·98	·43	·39	·83	2·01
September	·32	1·06	1·42	·51	2·12
October	21·10	(33·34)	16·61	29·61	15·28
November	7·13	4·09	3·66	6·89	5·71
December	39·92	41·07	16·54	9·61	15·43
Total for 1895	208·79	*(175·55)*	*(107·84)*	105·32	98·39
,, ,, 1894	109·34	...	58·27	80·28	52·84
,, ,, 1893	159·26	131·93	80·00	108·39	*(62·37)*

NOTE.—Italic figures indicate results partly observed and partly computed.

It would require weeks of work to justify the expression of an opinion as to the accuracy of the thousands of figures in these volumes, but our impression is that the work is very good. We have noticed only two doubtful entries, both in the first year, 1893. On page 53 the daily rain record for the Schmelz Reservoir at Vienna on January 22nd is 3·2 mm; it probably should be 23·2 mm, as all the other stations near Vienna had between 15 and 27 mm. And on p. 373 of the same volume we think that the river level at Primiero on February 4th should have been −20, not −30; very probably the observer reported −30, but we do not believe it to be correct.

The whole work is so exceptionally good that we can suggest but few directions in which improvement seems desirable. We have seen no reference to the pattern of rain gauge used, to the height of

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the funnels above the ground, or to the time of observation either of the rainfall or of the rivers. Details on these points are desirable.

There seems a little vagueness in the reference to average rainfall. The fall in the year 1895 is for several stations compared with the average, but we are not told of what years the average is computed, or whether it is of synchronous years at all stations.

It is perhaps not unreasonable to hope that a Bureau which is doing such splendid current work, and doing it so sumptuously, will before long take up the subject of old observations and give us an authoritative and exhaustive statement as to the rainfall of bygone years, so that we may have the best available information as to the secular variation of the fall of rain in the Austrian Empire.

There is no reference to the volume of water discharged by the rivers, or to the relation between it and the rainfall. Apparently the existing organization could give information of great importance as to the flow from large areas, and we hope that before long it will do so.

REVIEW.

The Great Meteoric Shower of November, by W. F. DENNING, F.R.A.S (Reprinted from The Observatory.) Taylor & Francis, Red Lion Court. 1897, 8vo. 52pp., 1 plate.

ALL who wish to know the history of the great meteor shower which (whatever it may be in the early hours of November 15th and 16th, 1897) will probably be grand on November 14th and 15th, 1898, should obtain this pamphlet.

Mr. Denning is a recognized leader in this class of work, and as such his words carry great weight. We see that on page 31 he says that one observer must have made a mistake when he said that "the largest of the 1866 shower was not twice the apparent brilliancy of Sirius"; but as Mr. Denning quotes without criticism somewhat similar statements by such authorities as Backhouse, Hind, and Baxendell, there is no need for us to do more than shrug our shoulders and leave Mr. Denning to believe in "half the size of the moon" if he likes. Those who saw the shower know that the startling feature was, not the magnitude of the individual meteors, but their great number.

The pamphlet would have been improved by an index or table of contents, and we see no reference to efforts to photograph the area surrounding the radiant, and very little respecting the curious and frequent appearance of end-on meteors, *i.e.*, those directed precisely towards the observer, who sees first a point of light which increases in magnitude, becoming hazy at the edges, and then suddenly dies out; but there is so much in the pamphlet that is useful and interesting that few will go without the best publication on the subject.

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INCREASED CLOUDINESS OF MALTA.

To the Editor of the Meteorological Magazine.

SIR,—In the *Meteorological Magazine* for September last (p. 121), touching upon the increased cloudiness of Malta registered during the last five years, you ask whether the change may not be due to a change of observers. The same question occurred to me some time ago, and set me to hunt up our record to see whether the variation in readings was really due to a change in the weather. The result of my search completely vindicated the observers. It is quite true that changes of observer have taken place. Previous to the winter of 1890-91, the Rev. J. Scoles, S.J., took all the observations. Towards the end of 1890 I assisted him, taking the morning observations, whilst he took those in the evening. In September, 1893, the Rev. R. Stevenson, S.J., took all the observations, and has done so ever since. Numerous comparisons shewed that my estimate of cloud agreed with that of the Rev. J. Scoles, and that the Rev. R. Stevenson's agreed with mine. The change then has been one of weather, more or less coincident with a change of observer. The spring and summer months here are characterised by sunny blue skies and very little cloud. Most of our cloudiness occurs in the autumn and winter months. During these latter months, east and southerly winds (warm, with high dew point) bring, almost invariably, overcast skies. A high average dew point for these months may then be taken to indicate the prevalence of these winds, and consequently of cloudiness. [*e.g.* As I write, a mild "sirocco," or S.E. wind is blowing, temp. 69°·5, dew point 67°·8, and the sky is completely overcast]. The following table, drawn up from our record, shews that, during the last five years, the dew point for the autumn and winter months has been very notably higher than during the five years preceding.

MEAN DEW POINT.

	Five years (1887-91).	Five years (1892-96).		Five years (1887-91).	Five years (1892-96).
	°	°		°	°
January.....	45·4	45·0	October.....	60·4	62·8
February	45·1	47·7	November	53·6	55·3
September.....	65·3	66·0	December.....	48·8	49·1

As personal equation will not account for this remarkable rise in dew point, I think that this table shews that there was, in all probability, as much cloud in the sky as the observers estimated. Again, our record of wind direction is explicit as to the unusual prevalence of southerly winds (called here "Venti bassi") during the last, as contrasted with the preceding, five year period.

I am, yours sincerely,

J. F. DOBSON, S.J.

St. Ignatius' College, Malta, October 18th, 1897.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, MAY, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	78·0	18	33·9	13	63·7	43·2	41·1	67	124·7	27·1	1·08	9	4·8
Malta	79·3	30	50·1	17	70·7	58·0	55·1	76	150·9	45·5	1·41	8	5·3
Mauritius	82·5	20	57·4	21	78·5	66·7	61·6	71	127·6	49·1	·66	6	4·4
Calcutta	104·6	9	70·2	30	95·6	79·0	75·2	68	161·7	66·9	3·78	6	3·8
Bombay	93·3	28	77·8	2	90·7	80·7	76·3	74	146·7	70·7	·00	0	3·3
Ceylon, Colombo	92·2	5	75·0	26	89·7	79·7	75·6	80	143·0	73·0	8·30	19	6·8
Melbourne	70·9	12	33·5	21*c*	60·5	43·5	42·8	69	120·0	23·2	1·97	8	5·7
Adelaide	72·2	16	41·5	21	65·0	48·7	44·9	67	133·0	31·6	2·09	12	5·2
Sydney	...	...	...	...	...	...	...	..	...	...	...	...	...
Wellington	65·5	7	35·0	21*e*	60·4	47·8	44·8	70	114·0	23·0	1·97	11	4·1
Auckland	70·0	3	40·5	24	63·1	50·6	47·6	71	124·0	34·0	6·63	19	5·8
Jamaica, Kingston	90·4	8*a*	69·9	18	87·9	73·6	72·2	72	...	...	3·47	11	4·9
Trinidad	94·0	4*b*	68·0	4	91·0	72·0	71·9	74	173·0	66·0	5·58	14	...
Grenada	87·0	16	72·4	19*d*	84·7	74·8	70·6	75	148·0	...	5·88	25	2·0
Toronto	73·0	18	34·9	22	61·0	44·1	43·5	69	88·5	27·2	3·02	12	6·8
New Brunswick, Fredericton	74·3	14	28·5	9	61·1	40·3	40·6	69	...	...	6·54	18	7·2
Manitoba, Winnipeg	88·0	4	23·0	31	67·8	38·3	...	...	...	...	1·59	11	4·5
British Columbia, Esquimalt	83·4	28	39·2	2	63·1	45·2	46·7	81	...	...	·62	7	4·9

a—and 23. *b*—and 8, 11, 12, 13. *c*—and 22. *d*—and 26. *e*—and 30.

REMARKS.

MALTA.—Adopted mean temp. 62°·9, or 1°·2 below the average. Mean hourly velocity of wind 12 miles. Average sea temp. 66°·0. TSS on 4th and 24th; L on 28th; H on 24th. Slight earthquake shocks on 27th. J. F. DOBSON.

Mauritius.—Mean temp. of air 0°·8, of dew point 2°·6, and rainfall 3·62 in., below their respective averages. Mean hourly velocity of wind 11·7 miles, or 1·5 above average; extremes, 28·1 on 29th, and 1·6 on 1st; prevailing direction E.S.E. Rainfall the least in May since 1875, excepting 1880, when ·49 in. fell. T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 5 days. L on the 27th. R. V. ALLEN.

Adelaide.—Mean temp. 0°·8 below, and rainfall ·80 in. below, the average of 40 years. The drought appears to be gradually breaking up, fair rains having fallen over a large portion of the colony. C. TODD, F.R.S.

Wellington.—Generally fine weather, with occasional showers and variable winds, up to the 26th; showery for the remainder of the month. Strong winds on five days from W. and N.W. L on 30th; S on hills on 30th and 31st; H on 30th. Temp. 2°·1 above, and rainfall 2·91 in. below, the average. R. B. GORE.

Auckland.—A wet and stormy month, the rainfall being 1·75 in. over the average, and the highest recorded in May since 1883. Mean temperature slightly under the average of 30 years. T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Heaviest rainfall on 5th when 1·75 in. fell in 1 hr. 45 min., between 7 and 9 p.m. TSS from the middle to the close of the month. J. F. BRENNAN.

TRINIDAD.—Rainfall 1·93 in. above the average of 30 years. J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, OCTOBER, 1897.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	·91	XI.	Rhayader, Nantgwillt ...	2·17
II.	Dorking, Abinger Hall .	·72	,,	Lake Vyrnwy	1·80
,,	Birchington, Thor	·28	,,	Corwen, Rhug	1·34
,,	Hailsham	·30	,,	Criccieth, Talarvor	1·26
,,	Ryde, Thornbrough	·44	,,	I. of Man, Douglas	2·32
,,	Emsworth, Redlands ...	·54	XII.	Stoneykirk, Ardwell Ho.	2·44
,,	Alton, Ashdell	·76	,,	New Galloway, Glenlee	3·80
III.	Oxford, Magdalen Col..	1·32	,,	Moniavie, Maxwelton Ho.	3·12
,,	Banbury, Bloxham	1·64	,,	Lilliesleaf, Riddell	1·80
,,	Northampton, Sedgebrook	1·41	XIII.	N. Esk Res. [Penicuick]	1·85
,,	Duddington [Stamford].	1·05	XIV.	Glasgow, Queen's Park..	1·71
,,	Alconbury	1·01	XV.	Inverary, Newtown	4·93
,,	Wisbech, Bank House...	1·12	,,	Oban, The Corran	...
IV.	Southend	·15	,,	Islay, Gruinart School ...	1·73
,,	Harlow, Sheering..... ...	·77	XVI.	Dollar.....	1·45
,,	Colchester, Lexden	·48	,,	Balquhidder, Stronvar...	5·33
,,	Rendlesham Hall	·46	,,	Ballinluig	2·92
,,	Rushall Vicarage	·69	,,	Dalnaspidal H.R.S.....	5·06
,,	Swaffham	·99	XVII.	Keith H.R.S.....	1·59
V.	Salisbury, Alderbury ...	1·56	,,	Forres H.R.S.	1·00
,,	Bishop's Cannings	1·46	XVIII.	Fearn, Lower Pitkerrie..	1·73
,,	Blandford, Whatcombe .	1·44	,,	N. Uist, Loch Maddy ...	2·80
,,	Ashburton, Holne Vic...	2·33	,,	Invergarry.....	4·32
,,	Okehampton, Oaklands.	1·63	,,	Aviemore H.R.S.	1·50
,,	Hartland Abbey	1·39	,,	Loch Ness, Drumnadrochit	1·86
,,	Lynmouth, Glenthorne.	1·06	XIX.	Invershin	3·93
,,	Probus, Lamellyn	1·69	,,	Scourie	...
,,	Wellington, The Avenue	1·23	,,	Watten H.R.S.....	3·22
,,	Wincanton.....	1·53	XX.	Dunmanway, Coolkelure	7·91
VI.	Clifton, Pembroke Road	1·22	,,	Cork, Wellesley Terrace	4·84
,,	Ross, The Graig	1·84	,,	Killarney, Woodlawn ...	5·92
,,	Wem, Clive Vicarage ...	1·38	,,	Caher, Duneske	3·88
,,	Cheadle, The Heath Ho.	1·11	,,	Ballingarry, Hazelfort...	2·82
,,	Worcester, Diglis Lock	1·72	,,	Limerick, Kilcornan ...	2·04
,,	Coventry, Priory Row...	1·81	,,	Broadford, Hurdlestown	...
VII.	Grantham, Stainby	·84	,,	Miltown Malbay	3·73
,,	Horncastle, Bucknall ...	·70	XXI.	Gorey, Courtown House	2·83
,,	Worksop, Hodsck Priory	·97	,,	Athlone, Twyford	2·76
VIII.	Neston, Hinderton	1·39	,,	Mullingar, Belvedere ...	2·87
,,	Southport, Hesketh Park	1·87	,,	Longford, Currygrane...	2·97
,,	Broughton-in-Furness ...	3·57	XXII.	Woodlawn	2·97
IX.	Ripon, Mickley.....	1·72	,,	Crossmolina, Enniscoe ..	3·67
,,	Melmerby, Baldersby ...	2·09	,,	Collooney, Markree Obs.	2·56
,,	Scarborough, Observat'y	1·64	,,	Ballinamore, Lawderdale	3·13
,,	Middleton, Mickleton ...	1·80	XXIII.	Warrenpoint.....	2·60
X.	Haltwhistle, Unthank...	1·72	,,	Seaforde.....	3·25
,,	Bamburgh	1·32	,,	Belfast, Springfield	2·18
,,	Keswick, The Bank.....	4·34	,,	Bushmills, Dundarave..	2·24
XI.	Llanfrechfa Grange	1·72	,,	Stewartstown	3·50
,,	Llandovery	2·18	,,	Killybegs	3·07
,,	Castle Malgwyn	3·06	,,	Lough Swilly, Carrablagh	2·68
,,	Builth, Abergwesyn Vic.	2·78			

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OCTOBER, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Date	Min. Deg.	Date.	No. of Nights below 32° In shade.
			inches.	inches.	in.							
I.	ENGLAND.	London (Camden Square) ...	·56	— 2·33	·14	18	9	67·2	17	31·9	7	1
II.		Tenterden	·24	— 3·79	·09	2,18	7	66·0	19	33·5	8	0
„		Strathfieldsaye	·11	...	·04	25	5	...	...	...	...	...
III.		Hitchin	·62	— 2·45	·19	18	13	65·0	17	30·0	6	3
„		Winslow (Addington)	1·24	— 1·85	·41	18	9	66·0	17*b*	28·0	6	3
IV.		Bury St. Edmunds (Westley)	·85	— 2·42	·39	2	8	63·0	17	37·0	...	0
„		Norwich (Brundall)	·94	...	·29	19	15	66·6	17	32·4	7	0
V.		Weymouth(LangtonHerring)	...	...	...	...	...	...	...	...	...	...
„		Torquay (Cary Green)	·94	...	·50	15	8	62·9	2	40·3	7	0
„		Polapit Tamar [Launceston]..	1·50	— 3·43	·56	14	14	66·2	19	30·3	7	2
VI.		Stroud (Upfield)	1·56	— 1·47	·55	15	11	64·0	1, 17	37·0	6*f*	0
„		ChurchStretton(Woolstaston)	1·10	— 2·67	·55	15	10	63·5	18	38·0	12*g*	0
„		Tenbury (Orleton)	...	...	...	...	...	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	1·36	...	·53	15	21	72·0	30	25·0	6	5
„		Boston	·91	— 2·20	·33	2	12	64·0	17	32·0	26	1
„		Hesley Hall [Tickhill].....	·99	— 2·11	·28	2	12	67·0	17	32·0	6, 26	1
VIII.		Manchester(PlymouthGrove)	1·76	— 1·61	·55	14	7	66·0	29	34·0	11	0
IX.		Wetherby (Ribston Hall) ...	1·57	— 1·56	·62	14	6	...	...	...	...	...
„		Skipton (Arncliffe)	2·97	— 3·06	·90	14	11	...	...	...	...	...
„		Hull (Pearson Park).	1·37	— 2·28	·43	2	7	65·0	17	30·0	13*h*	2
X.		Newcastle (Town Moor)	1·22	— 1·90	·53	14	5	...	...	...	...	...
„		Borrowdale (Seathwaite).....	8·72	— 1·87	1·64	16	15	...	...	...	...	...
XI.	WALES.	Cardiff (Ely).....	1·91	— 2·63	·39	14	12	...	...	...	...	...
„		Haverfordwest	1·96	— 3·19	·71	14	16	62·9	17	32·8	13	0
„		Aberystwith (Gogerddan) ...	1·81	— 3·54	·60	2	10	68·0	28	26·0	23	8
„		Llandudno.....	1·46	— 1·93	·54	2	15	66·0	17	42·0	13	0
XII.	SCOTLAND.	Cargen [Dumfries]	2·88	— ·38	·76	14*a*	8	64·0	22	26·0	14	2
XIII.		Edinburgh (Blacket Place)...	1·27	...	·48	14	10	64·5	17	29·7	14	2
XIV.		Colmonell	2·60	...	·52	16	12	70·0	6	27·0	13	...
XV.		Lochgilphead (Kilmory).....	3·98	— ·81	·74	16	15	...	...	25·0	13	2
„		Mull (Quinish).....	3·59	— 1·70	·58	17	15	...	...	...	...	...
XVI.		Loch Leven Sluices	1·70	— 1·26	·70	16	7	...	...	...	...	...
„		Dundee (Eastern Necropolis)	2·20	— ·04	1·05	15	14	61·0	3	29·7	14	2
XVII.		Braemar	2·74	— ·87	·90	17	15	64·2	22	24·0	26	8
„		Aberdeen (Cranford)	2·58	...	1·44	16	17	64·0	21*c*	29·0	13	2
„		Cawdor (Budgate)	1·13	— 1·60	·28	15	11	...	...	...	...	...
XVIII		Strathconan [Beauly]	4·23	— ·42	·96	15	8	...	...	...	...	...
„		Glencarron Lodge.....	6·11	...	·91	10	18	65·0	27	29·6	14	1
XIX.		Dunrobin	3·14	— ·17	1·20	15	14	62·0	20	31·0	14	3
„		S. Ronaldsay (Roeberry).....	3·03	— ·70	·48	15	17	57·0	21*d*	36·0	14	0
XX.	IRELAND.	Darrynane Abbey.....	4·34	...	·93	13	20	...	...	...	...	...
„		Waterford (Brook Lodge) ...	3·52	— ·30	·90	16	14	64·0	1	33·0	12	0
„		O'Briensbridge (Ross)	3·70	...	·49	17	15	...	...	...	...	...
XXI.		Carlow (Browne's Hill)	3·01	— ·28	·79	14	13	...	...	...	...	...
„		Dublin (FitzWilliam Square)	2·11	— 1·27	·64	14	14	62·9	17	36·1	12	0
XXII.		Ballinasloe	3·07	+ ·08	·74	16	19	59·0	17*e*	37·0	12	0
„		Clifden (Kylemore)	4·95	...	1·44	16	13	...	...	...	...	...
XXIII		Waringstown	2·63	— ·08	·86	14	14	65·0	21	29·0	12	1
„		Londonderry (Creggan Res.).	3·30	— ·37	1·03	15	16	...	...	...	...	...
„		Omagh (Edenfel)	3·43	+ ·33	1·05	14	15	61·0	20	32·0	12	1

+ Shows that the fall was above the average ; — that it was below it.

a—and 16. *b*—and 18, 30. *c*—and 22. *d*—and 28. *e*—and 20. *f*—and 7, 12. *g*—and 13. *h*—and 14.

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METEOROLOGICAL NOTES ON OCTOBER, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—By far the driest October recorded; 1879, with ·87 in., being the only other year out of 35 without an inch of R; 1890, with 1·21 in., was the last dry October. Ground remarkably dry, and ponds and wells very low. Mean temp. 5° higher than in 1896. Dews heavy, especially at the end of the month, but weather beautiful and like spring. Total sunshine 157 hours.

HITCHIN.—The driest October since 1878, and the second driest October in our record, which extends to 1849.

ADDINGTON.—A fine October; some days very fine, particularly the 30th, which was quite summer-like, bright and warm, while the 31st was foggy and cold, with a max. temp. 18° lower. Small rainfall, and little frost after that of the 6th, which cut off tender plants. Grand weather for the land; seed-corn got in in fine condition, and root crops well secured. Foggy on six days.

BURY ST. EDMUNDS, WESTLEY.—A very beautiful autumnal month, and the driest October since 1876. From the 14th very mild and summer-like, with foggy mornings and sunny days. Dense fog on 31st.

NORWICH, BRUNDALL.—The finest October for many years, and the driest since 1879. Rainfall 2·11 in. below the average. Mean bar. pressure 30·187 in. Mean temp. 50°·6. Dense fog on 19th. Wet fogs from 26th to 31st.

TORQUAY, CARY GREEN.—Rainfall 3·41 in. below the average. Total R of the ten months ·89 in. above the average. Mean temp. 54°·2, or 3°·1 above average. Duration of sunshine 97 hours 45 minutes, being 18 hours 35 minutes below the average. Ten sunless days.

POLAPIT TAMAR.—Uncommonly dry; the smallest rainfall for October during the past 17 years. Very calm generally throughout the month, and warm for the time of year. Prevalent winds easterly. Gale on 17th. Thick fog at night on 19th.

WOOLSTASTON.—A beautiful, bright, sunny, autumn month, with no frost and but little rain, except on the 15th, when it fell heavily. Mean temp. 50°·3.

ROTHERBY HALL.—The driest October since 1888, when only ·51 in. fell, the R being 1·70 in. below, or considerably less than half, the average of ten years. Although R fell in small quantities on 21 days, there were mild, bright intervals, and the autumnal tints have been more beautiful than usual. The ground was so hard that the customary first meet of the Quorn hunt (Nov. 1st) had to be postponed. Mean temp. 49°·0.

MANCHESTER, PLYMOUTH GROVE.—The rainfall of the month is the smallest in October for 31 years, with the one exception of October, 1888, when the rainfall was the same. Dense fog on 1st. T and L on the 10th. Fine autumn weather from the 16th to the end of the month, and very mild for the season.

ARNCLIFFE.—A very dry month, with little frost.

HULL, PEARSON PARK.—Fogs on 7 days, and all day on 30th.

WALES.

HAVERFORDWEST.—Since October, 1850 and 1879, there have been no very dry Octobers; in the first-mentioned year the fall was 2·09 in., and in the second 2·27 in.; thus it will be seen that October, 1897, had the least R of the series commencing 1849. Although the rainfall was small, there was a great deal of broken weather, and it was very wet from the 13th to 19th, with moderate gales from 15th to 17th. The last week was fine, with bright days and hoar frost on some nights. The month generally was mild, and the shade temp. did not fall below 32°. Fog on 7th, 19th, 20th and 28th.

ABERYSTWITH, GOGERDDAN.—Beautiful weather throughout the month, bright, and some days very hot. The finest October remembered.

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SCOTLAND.

CARGEN [DUMFRIES].—The month was characterised by very marked deviations from the means of 38 years; the bar. pressure being greater by ·269 in., the temp. higher by 1°·6, than the averages; while there was 1·61 in. less R and 44 hours more sunshine. The mean reading of the bar. for the month has only once been exceeded, in October 1879. Temp. has been higher and R less in 6 years since 1860, while only in 1870 and 1872 has more sunshine been recorded. The 14th was remarkably cold, the temp. not rising above 42°, and falling as low as 26°; on the 15th the mean temp. was 47°·5, and continued to rise until it reached 57°·6, on the 17th; for the seven days 16th to 22nd inclusive, the mean was 53°·1. 2·42 in. of R fell in the four days 14th to 17th, but no R fell after the 17th. Light easterly winds were prevalent. L on 23rd, and T on 29th.

EDINBURGH, BLACKET PLACE.—Mean pressure 30·106 in., the highest in October since 1866. Mean temp. 2°·0 above the average. Fog on 6 days, the greatest number in October since 1827, with six fogs, but in 1786 seven fogs were recorded. S.W. gale on 16th and 17th.

COLMONELL.—Rain 2·33 in. below, and mean temp. 4°·6 above, the average of 21 years.

MULL, QUINISH.—Wet and stormy till the 18th, then high temp. and constant sunshine. Laburnums in flower on 23rd, and ripe raspberries picked on 28th.

BRAEMAR.—Changeable and disagreeable to the 18th, but from thence finer weather could not be desired.

ABERDEEN, CRANFORD.—Warm for October, the min. temp. being above 50° on several nights.

S. RONALDSAY, ROEBERRY.—The first half of the month was wet, the second half very fine. Mean temp. 48°·5, or 2·5 above the average of 7 years.

IRELAND.

DARRYNANE ABBEY.—A fairly dry month, except from 11th to 18th inclusive, when 3·03 in. of R fell, 2·70 in. of which was on 13th, 14th, 15th and 16th. Nearly all the fall of ·83 in. on the 16th was after 6.30 p.m. L and a heavy peal of T on 15th.

WATERFORD, BROOK LODGE.—A very mild month, although there was a good deal of easterly wind. T and L between 10 and 11 p.m. on 15th.

O'BRIENSBRIDGE, ROSS.—Perfect weather from 17th to 28th; the days bright, warm and calm, and the nights fine, but chilly.

DUBLIN, FITZWILLIAM SQUARE.—Quite unlike the cold Octobers of 1894, 1895 and 1896, this month was strangely genial and fine; the temp. of the air actually rose towards the close, thus reversing the seasonal change for the time of year. The weather of the second week was, indeed, rough and wet; but this only accentuated the quietness and mildness of the beginning and end of the month. The mean temp., 52°·3, is 2°·6 above the average. The temp. in screen did not fall to 36°, or on the grass to 32°. L was seen on the 15th. High winds occurred on 9 days, attaining the force of a gale on 10th, 16th and 17th. Fog on 9 days; H on 10th; lunar halo on 7th; solar halo on 28th.

WARINGSTOWN.—A very fine month, with only a week's rain in the middle. Unusually warm; sub-tropical plants in sheltered situations being still uninjured at the end.

EDENFEL.—With the exception of the second week, when rains of a torrential character fell on three days, the month was one of the most remarkable Octobers on record, not only from the absence of R at other times, but from the frequently clear, and always calm and mild, atmosphere prevailing throughout.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXIII.] DECEMBER, 1897. [PRICE FOURPENCE, *or 5s. per ann. post free.*

A WET DAY IN A WET DISTRICT.

To the Editor of the Meteorological Magazine.

SIR,—When a man in any part of Britain finds over six inches of rain collected in his gauge in a day, it shows no unreasonable inquisitiveness if he asks his neighbours how they fared. Such was my position on the morning of 13th November, 1897, and I think your readers will care to see the result of my enquiry. There was nothing to call a storm—certainly no thunder storm—anywhere, only the rain kept pegging away (in my case for 23 hours out of the 24), as if it meant business, and indeed it was not idle the next day, for I measured 1·00 in. for 13th November.

I give, in the subjoined table, the record for 12th November: at 14 stations in "the Lake District," and add the number of days on which the same gauges have registered 3·00 in., or more, in a day, during the 7 years 1890–96, and the highest day's record in the same period. But, as these stations are in a wet district, I add also the average yearly rainfall at each for the same period. Seven years is, of course, an utterly inadequate period to give an average rainfall, but it serves to show the relative wetness of these stations, and for several of them no longer average is available. The figures for 12th November are very high, and I believe in most cases are the highest recorded since observations began, but to show how far the rainfall was excessive *for the locality* I have cast out how many average days rainfall that of 12th November amounted to, at each place. The highest equivalent in days is 28, or in other words, less than 8 per cent. of a year's rainfall fell on 12th. I think you have stated that 20 per cent., or in dry places 25 per cent., of a year's record may fall in a day, but those figures, fortunately, do not apply to this district,—if they did we should have no roads left.

Yours, &c.,

STEPHEN A. MARSHALL.

Skelwith Fold, near Ambleside.

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Rainfall in the Lake District, November 12th, 1897.

Stations.	Rainfall 12th November, 1897.	Average yearly rainfall, 1890-96.	No. of average days rainfall to equal that of 12th Nov., 1897.	No. of days in 7 years, 1890-96, giving 0·00 in., or more.	Highest day's record in those 7 years.	Fall on Nov. 12th, per cent. of yearly mean.
Lancashire—	in.	in.			in.	
Hawkshead (Esthwaite Lodge).....	4·22	68·67	22	2	3·70	6·2
Duddondale (Seathwaite Vicarage).	4·07	80·25	19	2	3·80	5·1
Skelwith Fold.....	6·03	80·53	27	3	3·18	7·5
Westmoreland—						
Skelwith Bridge.....	6·35	81·92	28	2	3·56	7·8
Ambleside (Lesketh How).....	4·45	78·03	21	0	2·97	5·7
Elterwater (Birch Hill)	4·57	90·75	18	8	4·24	5·0
Dungeon Ghyll.....	5·90	112·27	19	18	4·90	5·3
Loughrigg (High Close)	4·33	83·37	19	6	3·60	5·2
Grasmere (Pavement End).....	4·38	89·00	18	9	4·15	4·9
Patterdale.....	4·55	82·15	20	3	4·15	5·5
Cumberland—						
Borrowdale (Seathwaite)	8·03	131·39	22	27	6·79	6·1
,, (Rosthwaite)	6·94	101·43	25	10	5·33	6·8
,, (Grange).....	5·93	88·84	24	—	4·45	6·7
Derwentwater (Barrow House).....	3·98	72·19	20	1	3·01	5·5

[In the above letter Mr. Marshall has given the essential features of this remarkable rain, and the only addition which we can at present make to it, is to mention that in the much drier district round Cockermouth, the fall was between 4 and 4½ in., which of course was, relatively, even more remarkable. We are sorry to hear of one gauge having been washed away by a flood, and still more sorry (because it could have been prevented) to hear of two others having been allowed to run over. The following cutting gives a popular account of the rain. A few days later there were falls in North Wales (on 14th and on 18th) exceeding 4 in., but these must stand over for *Brit. Rain.*, 1897.—Ed.]

Heavy Storm in Kendal.—Until last week, for almost a whole month, there was no rain in the neighbourhood of Kendal, the fading autumn being remarkable in its mildness. In fact not since 1872 has there been such an autumn. As if to make amends for this long inaction a severe storm overwhelmed the district on Friday. Throughout the day the rain came down pitilessly—not in the half-hearted manner of the earlier showers which indicated the change, and between eight o'clock on Friday morning and eight o'clock the following morning no less than 2·73 in. of rain was registered by Messrs. Rhodes' rain gauge, only a third of an inch less than the whole quantity which fell in October. Naturally the Kent rose rapidly, and on Saturday morning had overflowed its banks, the footpath on Waterside being covered with water. On the shingle on New Road a number of swingboats had been erected for the Martinmas fair, but not a vestige of them remained this morning, the whole body being washed towards the estuary of the river. Other damage was done of a minor nature, and during the morning it was evident that the country above had not altogether escaped, hugh limbs of trees, &c., rolling along with the surging water. Between Kendal and Burneside many fields were flooded.—*Westmoreland Gazette.*

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THE GREAT METEORIC SHOWER OF NOVEMBER.

To the Editor of the Meteorological Magazine.

SIR,—When a man writes upon a scientific subject he at once assumes a serious responsibility, and it behoves him to be careful in presenting the truth in all the statements he makes and the figures he quotes. Now, when I said in my pamphlet on "The Great Meteoric Shower of November" that one of the observers of the shower in 1866 must have made a mistake when he said "the largest of the meteors was not twice the apparent brilliancy of Sirius," I did so on the best of evidence, and the statement can easily be substantiated. You take serious exception to it. Very well. There is a mass of observations in the *Monthly Notices Roy. Ast. Soc.*, Vol. 27; *British Association Report*, 1867; *Proceedings of the Meteorological Society* for November 21st, 1866; *Astronomical Register*, December, 1866, &c., &c., which distinctly proves one thing, and that is that some of the meteors were considerably brighter than Venus ever is, and far and away superior in lustre to twice that of Sirius. My pamphlet furnishes ample evidence on the point from the descriptions published at the time. I have not mentioned my own observations, but I may say that during the night I saw several meteors which momentarily lit up the sky and landscape with flashes more intense than the light of any planet. Taken as a whole, the meteors of November, 1866, were considerably brighter than the August Perseids; they were also brighter than the Andromedes of Biela's comet in 1872 and 1885, and brighter also than the average of members of ordinary meteoric streams.

You suggest that an index would have improved the pamphlet. So it would; but it was only a reprint, and extras were avoided to save expense. As to the stationary meteors, I have devoted a long paragraph to them on p. 27, and it is quite sufficient for the purpose, for the Leonid shower presents a hundred points besides end-on meteors. You say there is no reference to efforts to photograph the area surrounding the radiant. There is such a reference on p. 46, brief though it is, but I refrained from enlarging on the subject of meteoric photography, as it is a department in which I can boast of no experience whatever, and it is sometimes just as well not to assume to teach before one has played the part of pupil.—Yours faithfully,

W. F. DENNING.

Bristol, Dec. 7th, 1897.

[It is strange that Mr. Denning does not see that this letter does not carry matters farther than his pamphlet, for he has not disposed of either of the authorities we quoted—viz., Backhouse, Baxendell, and Hind—but he will probably be gratified by our printing the letter, and we have no objection to so doing. The concluding statements are excellent illustrations of the difficulty of finding what there is in a book without an index. We cannot devote any more space to the subject.—ED.]

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TEMPERATURE VARIATIONS IN NOVEMBER.

To the Editor of the Meteorological Magazine.

SIR,—The variations in the temperature at 9 a.m. during the past week have been so extraordinary that I think they are worthy of record:—

November 14th	....	55·1°	a fall of 17·0°
,, 15th	.....	38·1°	
,, 16th	.....	39·5°	a rise of 14·8°
,, 17th	.....	54·3°	
,, 18th	.....	52·9°	a fall of 21·4°
,, 19th	.....	31·5°	
,, 20th	.....	46·3°	a rise of 14·8°

This changeable weather has been very trying to the delicate and to old people, accompanied, as it has been, by considerable fog.

Yours very truly,

RICHARD TYRER.

Cheltenham, November 23rd, 1897.

Although at Camden Square the fluctuations of temperature in November, 1897, were not quite so great as at Cheltenham, they appeared to be sufficiently so to call for a study of back years to see how far they were exceptional, and the following table is believed to contain all cases in the 39 years, 1858–96, which approximate to the 1897 values. It will be seen that in five out of these eight November weeks the total range was greater than in 1897.

TABLE I.—*Weeks in November with great Variation of 9 a.m. Temperature at Camden Square.*

1897		1895		1893		1883		1867		1866		1865		1861	
Date.	Reading.	Date.	Reading.	Date.	Reading.	Date.	Reading.	Date.	Reading.	Date.	Reading.	Date	Reading.	Date.	Reading.
14	54°·8	14	48°·2	22	39°·1	4	45°·2	1	61°·2	8	55°·0	14	38°·2	23	38°·5
15	42·8	15	45·3	23	30·4	5	42·5	2	45·8	9	45·0	15	51·8	24	30·4
16	42·2	16	60·9	24	35·0	6	55·0	3	35·0	10	35·0	16	36·0	25	42·4
17	54·1	17	49·2	25	45·2	7	36·9	4	49·5	11	54·6	17	54·3	26	54·7
18	55·0	18	34·0	26	46·3	8	40·4	5	43·0	12	47·0	18	42·6	27	43·6
19	35·4	19	38·8	27	30·3	9	49·6	6	38·8	13	52·9	19	50·0	28	36·5
20	44·3	20	47·0	28	50·0	10	38·4	7	41·2	14	43·8	20	54·0	29	52·7
Total Range	19·6	...	26·9	...	19·7	...	18·1	...	26·2	...	20·0	...	18·3	...	24·3

It is not easy to adopt any rigid system of comparison between such variable data, but the seven calculations set out in the columns of the second table were assumed to give a fair indication of the variableness of each period, and every instance in which any four of the columns equalled or exceeded 1897 is set out in the table.

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TABLE II.—*Sum of the Variations of 9 a.m. Shade Temperature at Camden Square in November weeks showing excessive range.*

YEAR.	Greatest Variation in one direction.		Cumulative Variations in both directions.				
	Between 2 days.	Between 3 days.	3 days.	4 days.	5 days.	6 days.	7 days.
	°	°	°	°	°	°	°
1897	19·6	19·6	28·5	32·4	41·3	45·0	53·9
1895	15·6	26·9	27·3	42·5	47·3	55·5	58·4
1893	19·7	19·7	35·7	36·8	47·0	51·6	60·3
1883	18·1	18·1	30·6	34·1	43·3	54·5	57·2
1867	15·4	26·2	26·2	40·7	47·2	51·4	53·8
1866	19·6	20·0	29·6	39·6	47·2	53·1	62·2
1865	18·3	18·3	34·1	47·7	59·4	66·8	70·8
1861	16·2	24·3	24·3	35·4	46·7	58·7	66·8

In 1897 the greatest difference between any two consecutive 9 a.m. readings is 19°·6, while in 1866 it is the same (19°·6), and in 1893 slightly greater (19°·7); but taking periods of several days, 1866, 1865 and 1861 far exceed 1897 for variability of 9 a.m. temperature. Thus in one week in 1865 the 9 a.m. temperatures show a total zigzaging of 70°·8, while the 1897 fluctuations add to only 53°·9, which is with one exception the smallest value for a whole week in the table.

THE DROUGHT OF OCTOBER AND NOVEMBER, 1897.

To the Editor of the Meteorological Magazine.

SIR,—In your interesting paper on the dryness of October, 1897, I see no mention of Somersetshire; but the deficiency of rain here, at a point 8 miles W. from the Wiltshire boundary, and 5 miles N. from that of Dorset, though we did just pass the one inch, was, for a western county, more remarkable than that in many of the places which you did name; and now that an even drier November has followed it, the result seems worthy of record.

October yielded here 1·04 in. in 10 days, of which ·80 in. fell in four days (15th to 18th). November yielded ·96 in. in ten days, of which ·66 in. fell in the last four days, and a third part of that really in December. There was absolute drought from early morning of October 19th to late evening of November 7th, *i.e.*, more than 19 days. N.B.—A few heavy drops, not enough to measure, fell in the evening of October 29th. Partial drought could be reckoned till evening of November 27th, *i.e.*, more than 39 days with ·30 in. of rain. The total for the two months thus goes down as exactly two inches!

H. A. BOYS, M.A.

North Cadbury Rectory (250 ft. above sea), Dec. 1st, 1897.

P.S.—The first frost *at all* felt in my garden this autumn was on November 26th.

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To the Editor of the Meteorological Magazine.

SIR,—A dry November has followed a still drier October, 0·86 in. of rain having fallen here in October, and 0·95 in. in November. The average for the 10 years, 1887-96, is, for October, 3·31 in., and for November, 2·97 in., together 6·28 in., so that this year the fall in the two months was under 29 per cent. of the average for the last 10 years. Previously the least fall in October was 1·01 in. in 1888, in November, 1·14 in. in 1889, and for the two months together 4·03 in., in 1890. The remarkable circumstance is not, therefore, the small rainfall in *either* of these months, but that *both* the consecutive months which are usually about the wettest in the year should have been so dry.

Yours faithfully,
JOHN HOPKINSON.

The Grange, St. Albans, 6th December, 1897.

GALE ON NOVEMBER 28TH, 1897.

THE above ought not to pass without record in these pages. Although with many statements as to its severity we cannot agree, there is no doubt that very many lives were lost, and hundreds of thousands of pounds worth of property destroyed. The mischief, however, was due to tidal action rather than to that of wind. In London the barometric pressure fell fast (0·30 in. in 4 hours, noon to 4 p.m. on Sunday 28th), but this rate is by no means unprecedented, and we have known the wind much stronger. Confirmation thereof is afforded by the very trifling structural damage in the metropolis; one hoarding blown down, and a few slates and chimney pots carried away.

In the centre, E. and N. of England the gale was heavier, many chimneys and a few partly built premises, trees, and telegraph posts were blown down; but the damage was not comparable with that of the storms of March 24th, 1895, and of March 3rd, 1897.

Over the North Sea, and Southwestward, as far as Boulogne, the wind force was no doubt great, but the chief source of mischief was due to the intensity of the storm occurring at nearly the time of high water spring tide. Hence the Eastern coasts and both sides of the mouth of the Thames suffered severely, buildings being wrecked or flooded at Southwold, Ipswich, Harwich, Ramsgate, Margate, Herne Bay, Whitstable, Sheerness, Southend, Purfleet, Woolwich, and other places.

As is usual with such storms, there was some electrical disturbance. The first was at 8 p.m. on 27th, a single brilliant flash and very loud T at Durness, Sutherland. There was a TS in South Lincoln in the afternoon of 28th, and L was seen at various points along the coast from Suffolk to Yorkshire; later in the evening the TS became severe in South Nottinghamshire (the church of All Saints', Nottingham, was struck) and in the East Riding of Yorkshire. The L and T did not entirely cease until the early hours of the 29th.

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REMARKABLE HAILSTONES.

ABOUT 5 o'clock in the afternoon of August 10th I was at Manassas depôt, in Prince William County, Va., near the famous battlefield, waiting for a train. There was some pretty severe thunder and lightning for a half-hour or so, and then came a heavy shower of rain, during which there was the most remarkable fall of hail I have ever witnessed. I hurried out in the rain to examine the stones and picked up several. These were nearly square flattish blocks, say from $\frac{3}{4}$ to 1 inch in length and breadth, and from $\frac{1}{4}$ to $\frac{1}{3}$ an inch in thickness. They suggested, by both shape and size, the ordinary "chocolate caramels" of the confectioner. There were some 8 or 10 persons, I think, in the station house with me, and several of these, observing my interest and enthusiasm, began to pick up the larger stones and bring them in to me and to my friend, Professor Hargrove, of Luray, Va. Soon larger and larger ones were thus collected, and I sought for means of measuring or weighing them. No rule or scales could be found, and so we set ourselves, several of us, conjointly and carefully to estimate the dimensions. I recorded at the time one as being, honestly estimated, "2 inches long, $1\frac{1}{2}$ inches wide and $\frac{3}{4}$ of an inch thick," these being rather the average than the extreme dimensions.

It then occurred to me to make an outline drawing of the largest by laying it flat upon a page of my pocket memorandum and carefully running a pencil around it. I secured in this way, a rather rough but fairly accurate outline of two. These outlines have been exactly copied (including some lines due to a slipping of the block or to a different inclination of the pencil) and are given in the accompanying cuts. The extreme lengths of these will be found to be, respectively, about $2\frac{1}{2}$ and 3 inches; their extreme breadths about $1\frac{1}{2}$ and 2 inches. The thickness of No. 1 was recorded at the time as being by estimate $\frac{3}{4}$ inch; that of No. 2 as being 1 inch. I estimate their volumes as about $1\frac{3}{4}$ cubic inches for No. 1, and nearly 3 cubic inches for No. 2. The drawing of No. 2 was done more hastily, as just in the midst of it my train rushed in and I had to leave. But I took my trophy with me, and, with perhaps pardonable enthusiasm, paraded it through the cars, and, exhibiting it to the passengers, asked expressions of opinion from them as to its size relatively to that of a popular object of comparison, a guinea egg. Perhaps 20 or 30 passengers agreed, without dissent, that it was as large or larger. Some said, "It is as large as a hen's egg;" all agreed, also, that they had never seen so large a hailstone before. Upon breaking it to pieces, I found a sort of nucleus of somewhat less transparent ice at the centre, but observed no concentric layers or other marked structure of any kind; it was quite solid and tolerably transparent throughout. Both of these stones were characterized by blunt points or projections, as shown in the figures; and the sides also, while flat in the main, were uneven, with low, rounded elevations and depressions of the same sort, the general thickness being fairly uniform.

I think that very few of these stones or blocks fell. Perhaps they would have been a yard or two apart as they lay on the ground. I think it likely also that the storm of hail was of brief duration, say 10 or 15 minutes, and that it embraced a very limited area.

It was, perhaps, about over when I took the train, as I infer from the fact that I have seen no account of it in the papers; and I found at the next station, only 5 miles off, that the road was dry and dusty.

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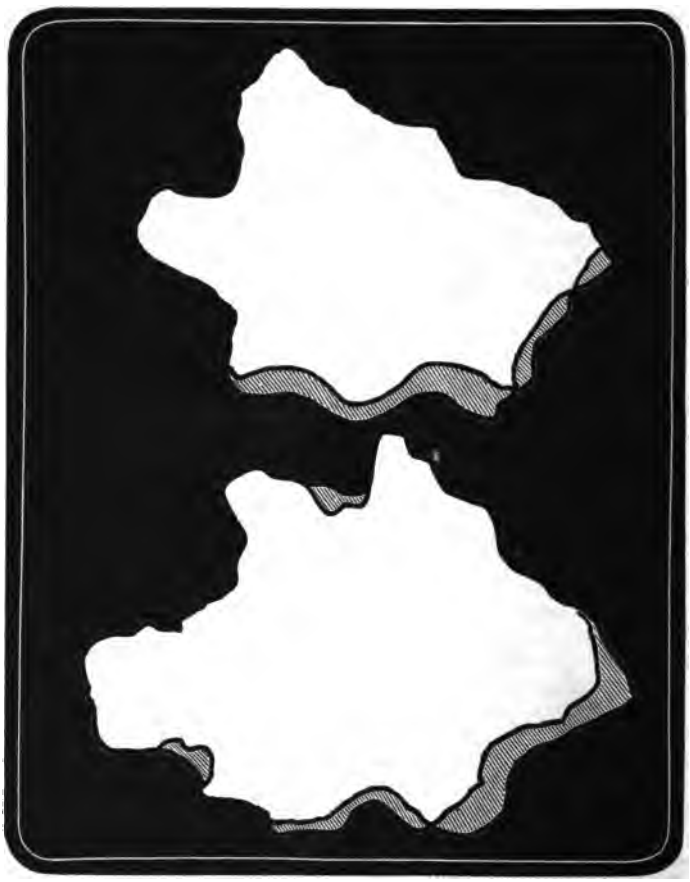
I regret exceedingly that no more accurate observations seem to have been made of what must have been a most notable hailstorm, and I diffidently submit my own crude and imperfect account in the hope that thereby something further may be elicited in regard to it.

CHARLES H. WINSTON.

Richmond College, Va., August 25th, 1897.

[*Science, September 17th, 1897.*]



Natural size of Hailstones which fell at Manassas, Virginia, U.S.A. (Lat. 38° 41′ N., Lon. 77° 33′ W.), August 10th, 1897.

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ROYAL METEOROLOGICAL SOCIETY.

THE opening meeting of the session was held on Wednesday evening, at the Institution of Civil Engineers, Mr. E. Mawley, F.R.H.S., President, in the chair.

The following candidates were elected Fellows of the Society—Charles Aburrow, A.M.I.C.E., William Berridge, Ronald Stanley Clarke, Lawrence Gibbs, A.M.I.C.E., Sholto Henry Hare, F.R.H.S., Henry George Hollingworth, F.R.G.S., F.R.A.S., Major Henry King, Arthur Newsholme, M.D.

Mr. R. H. Curtis reported the Results of a Comparison between the Sunshine Records of a Campbell-Stokes Burning Recorder and a Jordan Photographic Recorder.

The paper opens with a history and description of the two forms of recorder, and sets out the following conditions as requisite for a satisfactory comparison :—

(1)—Care must be taken that the instruments are in proper adjustment, and are fair examples of the types.

(2)—They should occupy positions similar in every respect, and such as to give an absolutely clear horizon.

(3)—The comparison should extend over a period sufficiently long to test them under varying seasons; and to detect any circumstance which might unfairly prejudice either instrument.

The observations were all made by Mr. E. T. Dowson, at Geldeston, Norfolk, in a position fulfilling the above requirements.

The curves from both instruments were measured independently by the author, and by three gentlemen, all experienced in dealing with sunshine traces, but neither tabulator saw the measurements of the others, nor did he know when tabulating the cards of one instrument what had been recorded for the same days by the other instrument.

The final values adopted for the twelve months, June, 1896,—May, 1897, are—

Tabulators.	A. Hours.	B. Hours.	C. Hours.	D. Hours.
Campbell-Stokes recorder...	1,500	1,500	1,522	...
Jordan recorder.....	1,363	1,412	1,416	1,454

The conclusions drawn from the figures are :—

The Campbell-Stokes records are capable of being measured with a very fair degree of accuracy.

The records of the Jordan instrument afford room for greater difference of opinion as to what ought to be tabulated, but when the whole of the photographic trace which can be distinctly seen, is carefully measured, the amount will approximate sufficiently to that of the Campbell-Stokes instrument to allow of records obtained from both forms of instrument being compared *inter se*.

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A section on the capabilities of the Campbell-Stokes recorder shows that it will register up to 15 minutes of the time of sunrise and sunset, while at Geldeston 94·5 per cent. of the possible duration was recorded on May 30th, 1881, and the same percentage at Jersey, on June 23rd, 1896.

The paper also discusses at some length the question how much of the trace of each instrument should be measured, photographic chemicals, effect of age on plates, and effect of washing to fix the trace. It gives for 12 years records for May at 7 Observatories, the results of tabulation at the Observatories and at the Meteorological Office, to show the effect of personal equation. It gives also a suggested specification for the Stokes recorder fixing density and size of sphere, and concludes with an appendix on the faulty instrument at Greenwich.

The President (Mr. Mawley) proposed a vote of thanks to Messrs. Dowson and Curtis. He was surprised to hear that the Jordan recorder gave a smaller value than the Stokes. He did not think that the Greenwich ball, which had a milk and water like appearance, could have been put up in that condition, but his own, which had been in use for 17 years, shows no sign of deterioration.

Mr. Ellis described the various instruments which had been used at various times at Greenwich, and gave a critical examination of the records to show the falling off in recent years.

Mr. Marriott spoke of the defects which he most frequently found in sunshine recorders when inspecting stations, and described his methods of testing their adjustment and exposure.

Mr. Kendrick spoke, as a scientific expert on glass, describing the composition of a ball supplied to Greenwich Observatory, the most suitable glass for the spheres, and the chemical action which is likely to take place and cause deterioration in some qualities of glass.

Mr. Davis said, that in the Argentine, glass spheres had remained perfect for 10 years. Stations at the foot of the Cordilleras recorded from 70 to 75 per cent. of the possible duration of sunshine, while those in the region of the great rivers recorded from 56 to 58 per cent.

Mr. Jordan, speaking of the photographic recorder, said that it was wrong to ignore any trace, no matter how faint. It cannot record too much, the faintest trace being necessarily due to the sun's rays, and as washing reduces faint traces it is all the more necessary to record everything. Experiments at Kew, and elsewhere, gave identical results for the two instruments, and he was, therefore, surprised at the results in the paper.

Mr. Gaster considered both the burning and photographic recorders excellent, and vastly superior to the estimates before they came into use. In the paper the measurements of the Jordan traces had been unduly restricted. The Jordan was introduced because the Campbell did not record the faintest sunshine, and originally the traces of the Jordan instrument were measured before washing, but the result was

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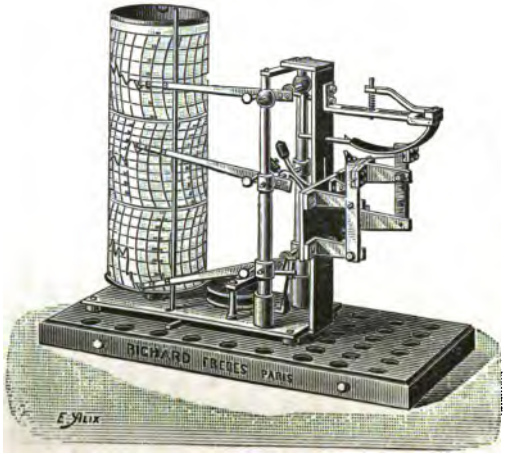
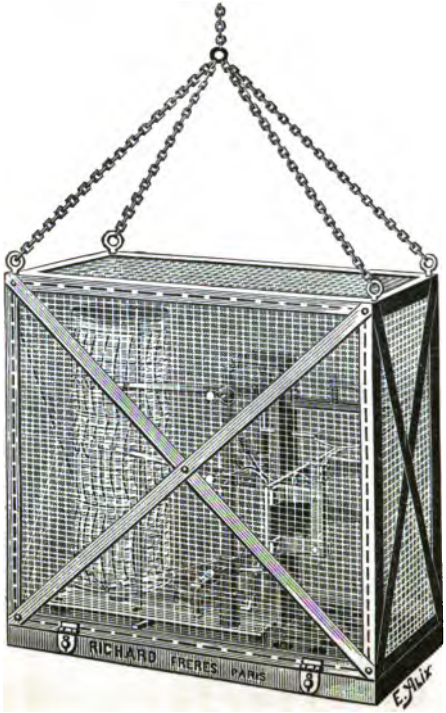
RICHARD'S BAROGRAPH, HYGROGRAPH, AND THERMOGRAPH.

(For use with Kites or a Balloon.)



THE INSTRUMENT.



In its Cage.

[See page 175.]

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so large that comparison was impossible, and, therefore, washing was introduced to make the records of the two instruments fit.

Mr. Brodie thought that the apparent agreement of the two instruments disappeared if the monthly values were examined, instead of the totals for the year; for in one winter month the Jordan gives 30 per cent. less, though on a fine winter day even the Stokes does not record enough.

Mr. Dixon hoped this excellent work would be continued, but it was impossible that the results of the two should agree, owing to the different absorption by the atmosphere, of the heat and of the actinic rays.

Mr. Symons read some remarks by Mr. Dowson on the different effect of an equal amount of washing, on the morning and afternoon traces of the Jordan record.

REVIEW.

Instruments de Précision. Ancienne Maison RICHARD FRÈRES, JULES RICHARD, *Fondateur et successeur. Catalogue No.* 1 *Météorologie.* 4to, Paris, 1897. 40 pp. and numerous engravings.

(*See Frontispiece.*)

THE catalogues of this firm are always interesting, for, the ingenuity of their instruments is remarkable, and the engravings are usually excellent; we mention this because the two which we have asked M. Richard to lend us are the weakest in the whole book.

We asked for these two because England is being left hopelessly in the rear in the exploration of the upper strata of the air—England, which, through Mr. Welsh, was the first to organise elaborate scientific work in balloons; which, through Mr. Glaisher, carried the same work to a point never before reached; England, which (through a Scotchman, Dr. Wilson) began the use of kites for scientific purposes in 1749; which, through the Rev. George Fisher and Admiral Back, used them in the Arctic regions in 1822–23 and 1836–37; which, through Mr. Douglas Archibald, was the first to send anemometers to great altitudes by means of kites—England and all the English colonies are doing absolutely nothing, and letting the Americans carry off all the honours for kite work, and our Continental neighbours all those relating to balloons.

We thought that an engraving of the compact little apparatus might tempt some Englishman to take up the subject of continuous records at high altitudes. Of course we cannot here go into full details, they are given in the work we are noticing; but it will be seen that pressure, humidity and temperature are simultaneously recorded on a single sheet of paper; and when we add that the total weight (the instrument being made of aluminium) is only *36 ounces*, it will be seen that the lifting of the apparatus is no difficulty.

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JUNE, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Absolute. Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	87·8	24	43·3	10	71·7	53·0	52·7	74	132·6	37·2	1·87	11	6·9
Malta	92·8	28	57·7	2	80·5	63·8	60·5	70	155·5	52·3	·00	0	2·4
Mauritius	80·9	1	59·8	25	76·7	66·7	61·6	73	126·2	50·4	2·51	13	5·8
Calcutta	97·1	10	73·5	2	90·5	79·0	77·6	81	161·0	72·7	10·98	12	7·0
Bombay	93·7	5	74·8	11	89·5	80·1	78·2	79	147·3	72·6	14·40	21	7·4
Ceylon, Colombo	91·2	9	73·8	20	86·4	77·7	76·1	87	142·5	72·0	10·14	25	7·8
Melbourne	67·7	18	31·5	13	59·2	43·4	43·9	76	117·1	20·9	1·64	7	3·2
Adelaide	69·0	8	39·1	12	60·2	47·8	44·9	72	124·0	28·1	1·59	11	6·5
Sydney	68·0	10	44·8	30	61·3	50·3	50·8	87	108·8	34·8	8·06	16	5·4
Wellington	60·0	8, 25	36·0	19	55·7	43·9	41·3	73	101·0	28·0	2·43	14	4·3
Auckland	64·0	13	40·0	21	58·7	47·3	44·0	72	120·0	34·0	3·70	17	6·1
Jamaica, Kingston	92·2	24	71·8	25	89·1	74·5	70·7	67	...	...	·58	5	5·3
Trinidad	90·0	*a*	69·0	6, 9	87·7	71·5	73·6	83	165·0	68·0	11·19	19	...
Grenada	85·8	1	71·0	4, 5	82·7	74·6	71·4	81	148·2	...	8·15	23	3·3
Toronto	84·0	24	38·8	2	71·2	51·0	51·2	68	100·0	32·2	2·92	10	5·7
New Brunswick, Fredericton	83·7	24	36·5	3, 8	67·1	45·6	47·4	60	...	...	3·18	14	5·9
Manitoba, Winnipeg	90·8	14	28·0	5	72·1	46·4	...	...	...	...	2·31	13	6·0
British Columbia, Esquimalt	72·2	21	41·2	10	65·2	50·5	48·2	72	...	...	·86	9	7·4

a—Several.

REMARKS.

MALTA.—Adopted mean temp. 71°·0, or 0°·6 below the average. Mean hourly velocity of wind 8·3 miles. Average sea temp. 71°·0. L on 6th, 7th and 8th.
J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0, of dew point 1°·0, and rainfall ·49 in., above their respective averages. Mean hourly velocity of wind 12·0 miles, or 0·6 above average; extremes, 26·1 on 6th, and 2·0 on 28th; prevailing direction E.S.E.
T. F. CLAXTON.

CEYLON, COLOMBO.—Thunderstorms occurred on 8 days. Lightning was seen on the 22nd, 23rd and 27th.
H. O. BARNARD.

Adelaide.—Mean temp. 0°·5 above the average of 40 years. Rainfall 1·22 in. below the average.
C. TODD, F.R.S.

Sydney.—Rainfall 2·36 in. above, temperature 1°·4 above, and humidity 9 above, their respective averages. Soft, warm rains fell all over the Colony so abundantly that the drought conditions were completely broken up, and the weather was very mild.
H. C. RUSSELL, F.R.S.

Wellington.—Generally a showery month, but no heavy falls except 1·21 in. on 5th; some pleasant days at the beginning and end of the month. Prevailing wind from N.W., strong on 6 days; frequent fogs. Temperature 0°·8 above, and rainfall 2·67 in. below, their respective averages. Slight earthquake on 9th.
R. B. GORE.

Auckland.—An unusually fine June, the rainfall being more than an inch under the average of 30 years. Mean temp. slightly under the average.
T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Rainfall about one-eighth of the average.
J. F. BRENNAN.

TRINIDAD.—Rainfall 3·15 in. above the average of 30 years.
J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, NOVEMBER, 1897.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	1·01	XI.	Rhayader, Nantgwillt ...	5·76
II.	Dorking, Abinger Hall .	1·18	,,	Lake Vyrnwy	6·51
,,	Birchington, Thor	1·39	,,	Corwen, Rhug	3·76
,,	Hailsham	1·45	,,	Criccieth, Talarvor	5·31
,,	Ryde, Thornbrough	1·70	,,	I. of Man, Douglas	5·99
,,	Emsworth, Redlands ...	1·45	XII.	Stoneykirk, Ardwell Ho.	3·60
,,	Alton, Ashdell	1·39	,,	New Galloway, Glenlee	5·66
III.	Oxford, Magdalen Col..	1·09	,,	Moniaive, Maxwelton Ho.	3·84
,,	Banbury, Bloxham	·97	,,	Lilliesleaf, Riddell	2·08
,,	Northampton, Sedgebrook	1·06	XIII.	N. Esk Res. [Penicuick]	3·75
,,	Duddington [Stamford].	1·18	XIV.	Glasgow, Queen's Park..	3·37
,,	Alconbury	·89	XV.	Inverary, Newtown	5·63
,,	Wisbech, Bank House...	1·69	,,	Oban, The Corran	4·55
IV.	Southend	·94	,,	Islay, Gruinart School ...	2·43
,,	Harlow, Sheering..... ...	1·16	XVI.	Dollar.....	3·87
,,	Colchester, Lexden	·93	,,	Balquhidder, Stronvar...	5·82
,,	Rendlesham Hall	1·05	,,	Ballinluig	2·65
,,	Rushall Vicarage	1·82	,,	Dalnaspidal H.R.S.....	4·72
,,	Swaffham	1·56	XVII.	Keith H.R.S.....	2·58
V.	Salisbury, Alderbury ...	·80	,,	Forres H.R.S.	1·43
,,	Bishop's Cannings	1·10	XVIII.	Fearn, Lower Pitkerrie..	1·10
,,	Blandford, Whatcombe .	·91	,,	N. Uist, Loch Maddy ...	3·97
,,	Ashburton, Holne Vic...	4·38	,,	Invergarry.....	3·60
,,	Okehampton, Oaklands.	3·01	,,	Aviemore H.R.S.	2·25
,,	Hartland Abbey	3·03	,,	Loch Ness, Drumnadrochit	2·87
,,	Lynmouth, Glenthorne.	3·80	XIX.	Invershin	3·11
,,	Probus, Lamellyn	3·48	,,	Scourie	...
,,	Wellington, The Avenue	1·52	,,	Watten H.R.S.....	1·77
,,	Wincanton.....	1·21	XX.	Dunmanway, Coolkelure	9·65
VI.	Clifton, Pembroke Road	2·06	,,	Cork, Wellesley Terrace	4·86
,,	Ross, The Graig	1·87	,,	Killarney, Woodlawn ...	6·25
,,	Wem, Clive Vicarage ...	1·96	,,	Caher, Duneske	5·38
,,	Cheadle, The Heath Ho.	2·99	,,	Ballingarry, Hazelfort...	5·31
,,	Worcester, Diglis Lock	1·61	,,	Limerick, Kilcornan ...	4·72
,,	Coventry, Priory Row...	1·50	,,	Broadford, Hurdlestown	5·60
VII.	Grantham, Stainby	·97	,,	Miltown Malbay	6·53
,,	Horncastle, Bucknall ...	1·98	XXI.	Gorey, Courtown House	4·71
,,	Worksop, Hodsck Priory	2·02	,,	Athlone, Twyford	4·42
VIII.	Neston, Hinderton	2·78	,,	Mullingar, Belvedere ...	5·21
,,	Southport, Hesketh Park	4·74	,,	Longford, Currygrane...	4·14
,,	Broughton-in-Furness ...	8·43	XXII.	Woodlawn	4·58
IX.	Ripon, Mickley.....	1·54	,,	Crossmolina, Enniscoe ..	3·94
,,	Melmerby, Baldersby ...	1·53	,,	Collooney, Markree Obs.	3·72
,,	Scarborough, Observat'y	2·48	,,	Ballinamore, Lawderdale	4·28
,,	Middleton, Mickleton ...	2·11	XXIII.	Warrenpoint.....	4·49
X.	Haltwhistle, Unthank...	2·67	,,	Seaforde.....	3·52
,,	Bamburgh	2·26	,,	Belfast, Springfield	3·22
,,	Keswick, The Bank.....	7·00	,,	Bushmills, Dundarave..	2·35
XI.	Llanfrechfa Grange	4·44	,,	Stewartstown	2·64
,,	Llandovery	4·46	,,	Killybegs	4·67
,,	Castle Malgwyn	4·64	,,	Lough Swilly, Carrablagh	2·74
,,	Builth, Abergwesyn Vic.	7·43			

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NOVEMBER, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	1·05	— 1·61	·31	27	14	59·1	18	28·0	26	2	7
II.		Tenterden ...	1·07	— 2·32	·28	27	17	60·0	14*b*	25·0	26	2	8
„		Strathfieldsaye ...	...	...	...	...	...	...	...	...	...	...	...
III.		Hitchin ...	1·13	— 1·55	·31	28	12	58·0	14*a*	27·0	25	8	...
„		Winslow (Addington) ...	1·25	— 1·68	·26	28	14	59·0	14	27·0	19	7	9
IV.		Bury St. Edmunds (Westley)	1·09	— 1·46	·24	27	10	58·0	13	29·0	26	...	...
„		Norwich (Brundall) ...	1·54	...	·41	28	16	60·2	14	29·6	26	4	16
V.		Weymouth(LangtonHerring)	...	...	...	...	...	...	...	...	...	...	...
„		Torquay (Cary Green)	1·25	...	·24	14	12	60·3	18	34·0	30	0	1
„		Polapit Tamar [Launceston]..	2·70	— 1·64	·47	28	12	62·8	1	25·8	6	9	12
VI.		Stroud (Upfield) ...	1·72	— 1·61	·57	27	16	58·0	13*c*	31·0	29	1	...
„		ChurchStretton(Woolstaston)	2·02	— 1·50	·37	28	14	57·0	9, 11	30·0	16	2	7
„		Tenbury (Orleton) ...	...	...	...	...	...	...	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	1·32	...	·24	14	20	...	...	...	...	0	14
„		Boston ...	1·58	— ·62	·35	28	12	58·0	20	30·0	11	5	...
„		Hesley Hall [Tickhill]...	1·94	— ·08	·68	30	16	58·0	12*d*	29·0	23	5	...
VIII.		Manchester(PlymouthGrove)	4·20	+ 1·20	1·36	30	14	61·0	1	32·0	...	4	8
IX.		Wetherby (Ribston Hall) ...	1·06	— 1·01	·40	14	11	...	...	...	...	...	...
„		Skipton (Arncliffe) ...	5·78	— ·97	·95	28	17	...	...	...	...	...	...
„		Hull (Pearson Park)...	2·58	+ ·57	·69	30	14	58·0	13*e*	28·0	16	6	8
X.		Newcastle (Town Moor) ...	1·67	— ·73	·38	14	14	...	...	...	...	...	...
„		Borrowdale (Seathwaite)...	20·85	+ 6·06	3·03	12	15	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely)...	3·28	— 1·63	·81	12	13	...	...	...	...	...	...
„		Haverfordwest ...	5·06	— ·80	1·14	12	18	60·0	1	31·0	19*f*	2	11
„		Aberystwith (Gogerddan) ...	5·58	+ ·47	1·27	26	14	61·0	1	...	...	...	...
„		Llandudno...	4·66	+ 1·57	2·43	30	11	63·0	1, 9	35·0	15	0	...
XII.	SCOTLAND.	Cargen [Dumfries] ...	4·50	— ·06	1·26	12	14	59·4	1	26·0	15*g*	5	...
XIII.		Edinburgh (Blacket Place)...	1·97	...	·41	12	16	57·3	12*d*	27·3	16	2	5
XIV.		Colmonell ...	4·34	...	·78	12	12	60·0	2	24·0	3	...	...
XV.		Lochgilphead (Kilmory).....	4·36	— 2·93	·69	27	17	...	...	26·0	14	3	...
„		Mull (Quinish)...	4·05	— 2·94	·79	11	19	...	...	...	...	...	...
XVI.		Loch Leven Sluices ...	2·90	— 1·06	·90	13	11	...	...	...	...	...	...
„		Dundee (Eastern Necropolis)	1·85	— ·85	·45	12	16	57·9	12	24·1	16	2	...
XVII.		Braemar	2·23	— 2·35	·54	28	13	55·0	12	11·6	16	8	15
„		Aberdeen (Cranford)	1·95	...	·60	14	19	60·0	19	20·0	15	6	...
„		Cawdor (Budgate) ...	2·44	— ·41	·63	13	15	...	...	...	...	...	...
XVIII		Strathconan [Beauly] ...	4·15	— 2·41	·80	22	14	...	...	...	...	...	...
„		Glencarron Lodge...	9·25	...	1·47	13	20	57·0	8	19·8	16	6	...
XIX.		Dunrobin ...	2·01	— ·82	·60	28	14	56·0	19*e*	28·0	16	6	...
„		S. Ronaldsay (Roeberry).....	4·35	+ ·93	·81	13	22	54·0	12	30·0	15	5	...
XX.	IRELAND.	Darrynane Abbey...	7·25	...	1·97	16	16	...	...	...	...	...	...
„		Waterford (Brook Lodge) ...	6·81	+ 3·14	1·25	24	15	60·0	8	31·0	16	1	...
„		O'Briensbridge (Ross) ...	7·63	...	1·34	30	14	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill) ...	4·59	+ 1·53	·70	13*a*	16	...	...	...	...	...	...
„		Dublin (FitzWilliam Square)	3·42	+ ·59	·94	13	14	60·9	12	34·9	15	0	3
XXII.		Ballinasloe	4·33	+ ·42	·69	24	18	58·0	9, 10	27·0	26	2	...
„		Clifden (Kylemore)	6·92	...	1·71	11	16	...	...	...	...	...	...
XXIII		Waringstown ...	3·47	+ ·37	·58	26	17	59·0	1	29·0	14	3	10
„		Londonderry (Creggan Res.).	2·88	— 1·64	·66	28	18	...	...	...	...	...	...
„		Omagh (Edenfel) ...	...	...	...	...	...	...	...	...	...	...	...

+ Shows that the fall was above the average ; — that it was below it.

a—and 17. *b*—and 18. *c*—and 14. *d*—and 13. *e*—and 20. *f*—and 23. *g*—and 16.

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METEOROLOGICAL NOTES ON NOVEMBER, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—Another very dry month, the total R being the least in November during 35 years, except ·58 in. in 1871, ·79 in. in 1879, and 1·03 in. in 1867. Partial drought for 45 days ended on 13th. Flowers, such as calceolarias, heliotrope, marigolds, &c., blooming fully till cut by frost of 26th. Two days with temp. above 60°. Duration of sunshine 69 hours. Fearful W. and N.W. gale on 28th and 29th. Fog all day on 9th and 23rd.

ADDINGTON.—Very little R until the end of the month. Fogs rather frequent, and sometimes dense, as on the 22nd and 23rd. High winds on the 28th, 29th, and 30th. On the 28th much lightning at night. On the 30th a very heavy R and H storm at 6 p.m., lasting about five minutes.

BURY ST. EDMUNDS, WESTLEY.—Mild and dry, with no frost till the 27th, tender plants remaining in bloom till that date. Very severe gale at night on 29th and on 30th; much damage to stacks, &c.

NORWICH, BRUNDALL.—Total R 1·25 in. below average. A very mild month. Mean temp. 45°·2. The gale on 28th and 29th was exceedingly severe from N.W., lasting nearly 24 hours, although not so destructive as that of March, 1895, when all the damage was wrought in about three hours. Much damage was done on the coast by the extraordinary high tide blown up by the gale, which is said to be the highest tide on the Norfolk coast within living memory. Generally dry, with high bar., bright days at times, but generally much cloud, and considerable fog at times.

TORQUAY, CARY GREEN.—Rainfall 2·79 in. below the average. Total rain of the eleven months, 29·12 in., being 1·90 in. below the average. Mean temp. 49°·4, or 2°·3 above average. Duration of sunshine 33 hours 55 minutes, being 30 hours 10 minutes below average; 15 sunless days.

POLAPIT TAMAR.—Generally a dry month, but the last four days were wet, stormy, and cold. Fog on seven days; half a gale from S.S.W. on 13th, and from N.W. on 28th, with H and T at 11 p.m. Stormy, with heavy H on 30th.

WOOLSTASTON.—Another warm, dry month, the nights especially warm. Severe gale on 28th, with L, and a little S, the remainder of the month was very stormy. Mean temp. 44°·8.

ROTHERBY HALL.—On the whole November was a dry month, with ·74 in. less R than the average. The force of the wind varied from calm to a full half gale. The weather was very changeable, some days being bright, but more than half their number were dull. Fog on 10 days, sometimes dense.

HULL, PEARSON PARK.—Fog on 8 days, dense on 9th and 11th. TS with H, and stormy at night on 28th. H on 29th.

SEATHWAITE.—On 8 days the R exceeded an inch, while on the 12th 8·03 in. fell, causing a flood.

WALES.

HAVERFORDWEST.—Fine weather prevailed during the first six days, with some hoar frost, and partially clear sky; foggy, misty, damp weather succeeded, and continued to the 11th, when a moderate to fresh gale sprang up, culminating in a heavy rainfall, 1·92 in. falling in 24 hours, on 12th and 13th. Weather of a foggy, misty character prevailed throughout the remainder of the month, with an occasional frost at night, and from the 26th to the end it was very stormy and unsettled, with much rain. A vessel was wrecked in Fishguard Bay. Abundance of grass resulting from the unusual mildness.

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ABERYSTWITH, GOGERDDAN.—Very stormy in the last week of the month.

LLANDUDNO.—A remarkably fine month for November, the amount of sunshine recorded being 72·8 hours. Stormy, with L and H at night on 28th, and wet and stormy on 30th, when 2·43 in. of R fell, mostly between noon and 2 p.m.

SCOTLAND.

CARGEN [DUMFRIES].—Dry weather continued until the 7th, and during 20 days, 18th October to 6th November, no R fell. Mean temp. 3°·0 above the average, exceeded only in 1876, 1881, and 1894, during 38 years. On only two days, 15th and 16th, did the temp. fall below 32°, while on the night of the 20th the min. was 50°. Upwards of half the total R fell during the four days 11th to 14th. The total for the eleven months of the year is only ·25 in. less than the average. A feature of the month was the remarkable absence of sunshine, the number of hours registered being only 31, against the average of 79. Easterly winds, mostly light, prevailed on 16 days, somewhat unusual in November. The mild open weather was exceptionally favourable for farm stock, pastures looking fresh and green. L in evening of 28th.

EDINBURGH, BLACKET PLACE.—Mean temp. 45°·6, the only warmer Novembers since 1764 being 1818, 1881, and 1894, with mean temps. of 46°·7, 46°·3, and 46°·0, respectively. The mean of the minima was 41°·8, the highest since 1857, when the average was 41°·9. Barometric pressure ·295 in. above average, a value exceeded since 1770 in the Novembers of 1805, 1857, 1867, 1879, and 1896. Dense fog on 11th. Strong N.E. wind, with H and S on 14th. Strong gale, with sleet and S on 28th.

COLMONELL.—Rain ·91 in. below, and mean temp. 4°·9 above, the average for 21 years.

BRAEMAR.—A month more like summer than autumn.

ABERDEEN, CRANFORD.—The month was very warm, the min. temp. on several nights being above 45°, and on the 12th 50°. Little sunshine. A heavy gale from N.N.W. on 28th and 29th.

S. RONALDSAY, ROEBERRY.—The first half of the month was very good, the latter cold and wet. Mean temp. 44°·3, or 1°·3 above the average of 7 years.

IRELAND.

DARRYNANE ABBEY.—Excepting the last week, a very mild month, some days quite summer-like. Although the total R is high, 7·25 in., yet the number of rainy days is not large; 5·56 in. of R fell in 8 days between 9th and 17th, leaving 1·69 in. for the rest of the month. N.W. gale and H on 30th.

WATERFORD, BROOK LODGE.—The weather was so mild that the following plants were in bloom in the garden up to the end of the month—nasturtiums, gentia, clematis, primroses, poppies, heliotrope, and roses. Gale from S.E. on 7th, and from W. on 30th. L on 29th.

O'BRIENSBRIDGE, ROSS.—The first week was beautiful, and there were some very fine days in the middle of the month, which closed with fierce rain storms, T and L.

DUBLIN, FITZWILLIAM SQUARE.—A dull, mild, foggy month on the whole, mean temp. 48°·6, or 3°·9 above the average. High winds were noted on 11 days, but attained the force of a gale only on the 28th. Fogs on 11 days. Lunar halos on the 8th and 29th. H, sleet and S fell in the gale on the 28th, when also L was seen.

KYLEMORE HOUSE.—Gale and R on 26th. Stormy, with W. wind on 27th, and the severest gale of the season on the 28th.

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SYMONS'S
MONTHLY
METEOROLOGICAL MAGAZINE.

CCCLXXXIV.] JANUARY, 1898. [PRICE FOURPENCE, or 5s. per ann. post free.

Joseph Warren Zambra.

1822-1897.

JUST at the close of the year we have to announce, with regret, the death of Mr. Zambra, the last of the trio to whom—especially in the period 1850-1870—we are chiefly indebted for the excellent instruments now used at meteorological stations. Mr., or to give him his proper title, Cavaliere Negretti, passed away first, and now in 1897 we have lost both Mr. Casella and Mr. Zambra. Happily—though perhaps no one ever surpassed Negretti as a glass blower—they have all imparted much of their knowledge to their successors, and all have left sons to, we hope, worthily follow in their fathers' footsteps.

GALE ON NOVEMBER 28TH, 1897.

UNDER this title we gave last month some remarks contrasting the proportion of damage due to wind force and wave action, and stated that "The mischief was due to tidal action rather than to that of wind." We then little thought what excellent data upon the subject were being collected, but on the very day that the *Met. Mag.* was published an excellent account of the flooding appeared in the *Engineer* of December 17th, 1897, signed by Mr. Wheeler, C.E. of Boston, probably the most competent authority in the world.

Now, thanks to Mr. Wheeler's kindness, we are able to offer to our readers what may, perhaps, be regarded as a second edition of the report, with such additions as Mr. Wheeler received after that in the *Engineer* had been printed.

In our own little note we made one incorrect statement, and we are glad that it has been detected, because it shows how sharply our words are watched, and it keeps us up to the mark. We said that the mischief was due "to the intensity of the storm occurring at nearly the time of high water spring tide." Happily the spring

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tides had passed four or five days, or the damage would have been, as Mr. Wheeler says, "even more serious." We fell into the error through knowing that as an actual fact the level reached was much above that of "high water spring tide," but the cause was wind, rather than tide.

THE NOVEMBER GALE AND THE TIDES.

By W. H. Wheeler, M. Inst. C.E.

The subject of the effect of the wind and atmospheric pressure on the tides was brought before the British Association at the Ipswich meeting in 1895, in a paper read by me, and in the following year at Liverpool, a report on the same subject was presented by a committee which had been appointed to investigate the matter. With the aid of information kindly furnished to me in reply to my inquiries from the harbour masters of several ports round the coast, I am able to supplement the information already given, by the following account of the effect on the tides of the gale of November last.

The severe gale of the 28th and 29th of November, which caused such serious damage all along the south-east coast of this country, had the effect of raising the tide to an abnormal height, the tide of the following day being considerably depressed. The wind appears to have had the greatest effect in increasing the height of the tide along the part of the coast extending from the Humber to the east end of the English Channel. The wind on the previous days had been blowing strongly from the south-west, a condition favourable to increasing the height in the Channel; it then flew round to the north-west, a quarter which always raises the tide in the North Sea. The combined influence of the winds from these two opposite quarters would therefore tend to concentrate the full effect of the tide along the south-eastern coast, and the records of the damage done to the cliffs and in flooding, owing to the water breaking through or flowing over the banks, and doing other damage, show that this was the case. Fortunately, the gale occurred five days after the full moon, or the effect would have been even more serious.

On Saturday, the 27th, round the south and east coasts the wind was blowing all day strongly from the south-west, the force varying, according to the different reports received, from 5 to 7 of the Beaufort scale; the barometer varying from 29·92 in. at Spurn Point, to 30·13 in. at the North Foreland. On Sunday the barometer had fallen to 29·49 at Spurn and 29·76 at the North Foreland, continuing to fall to 29·10 towards Monday; the wind blowing from the north-west with force of 10, veering to south-west on Tuesday, with force of 3 to 6. New moon was on the 24th, so that the spring tides were falling off. Under these conditions the effect of the gale in raising and depressing the tide was as follows:—

At Sunderland the increase from the computed normal height was 2ft. 10in., and at Tynemouth 2ft. 4in.

At Spurn the water washed over the lifeboat cottage and inn, and carried away a great part of a large chalk and timber groin constructed for the protection of the point.

At Grimsby the morning tide of the 29th rose 5ft. 11in. above the calculated height, the next day's tide being 1ft. 9in. less, the actual difference in height between the two tides being 8ft. 9in. At Hull the tide was 5ft. 3in. above the normal height.

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At Cleethorpes, at the mouth of the Humber, at high water the tide swept the Promenade from end to end, and carried away the whole of the sea defences which have recently been constructed for the protection of the town and land.

At Mablethorpe, and lower down the Lincolnshire coast to Skegness, the tide did considerable damage to the sand dunes, in some places running over the banks and flooding the land and gardens behind, and doing an immense amount of damage to bathing machines, boats, and the promenades.

In the Wash the morning tide rose 5ft. 3in. above the calculated height at Boston Dock, the difference between this tide and that of the following day being 8ft. 8in. At Lynn the increase was 7ft., the difference between the two tides being 11ft. 11in., the effect of the wind from the north-west being more felt here than on the other side of the Wash, a large amount of damage was done in the flooding of houses and granaries, in some cases the water rising 4ft. above the floors. A portion of the permanent way of the Hunstanton Railway was washed away owing to the tide flowing over the banks near Heacham, and traffic was stopped.

At Holme, Thornam, Burnham, Cley, and Blakeney, the sea banks which enclose the Marsh land were overflowed and broken, and were injured to an extent requiring several thousand pounds to reinstate them. The lands were flooded, and the houses of the inhabitants submerged; at the village of Salthouse the lower rooms of 90 houses having been submerged.

At Wells also the water found its way into the houses and shops.

At Sheringham, Cromer, and Mundesley great damage was done to the cliffs; and at Palling the high tide carried away several feet of the sand hills.

Between Winterton and Happisburgh the sand hills were clean cut down from five to twelve yards.

Owing to the height of the tide the salt water was driven for an unusual distance up the rivers which run through the Broads, killing great numbers of fresh water fish.

At Horsey Gap, several breaches were made in the sea bank, through which the tide poured and inundated the land at the back.

All along the coast from the Wash to the Thames the tide was abnormally raised, the increase at Yarmouth being 8ft., or 2ft. more than the full rise of a spring tide, the difference between this and the tide of the following day being 9ft. 3in. The quays, marine drive, and the beach garden at Yarmouth were all flooded.

At Lowestoft some of the principal streets of the town were flooded, the masonry of the esplanade was broken down, and the embankment of the railway so damaged at Oulton that traffic had to be suspended.

At Harwich the water broke over the sea bank, carrying a laden barge through a breach into the street. Nearly 300 cottages were flooded to a depth of 6ft.

At Aldeburgh a large breach was made in the sea wall, the land and houses were inundated, and the permanent way of the railway was undermined.

At Ipswich the increase on the tide of the day was 6ft. 6in. An immense amount of damage was done all along this part of the coast by the breaking down of the cliffs.

At the mouth of the Thames the damage done by the high tide and gale was greater than on any other part of the coast.

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The banks of Canvey Island suffered considerably, a large area of the enclosed land being flooded. The tide flowed over the bank from Leigh to Pitsea Island and also that at Purfleet, inundating the land behind, and also the houses in the village of Leigh.

Tilbury Marshes and the whole of the lower part of Grays were inundated to a depth of several feet, and the Tilbury Railway was under water in several places.

At Gravesend, the tide rose to 3ft. 4in. above Trinity high-water mark, or within 5in. of the great tide of 1881, the highest on record, the difference in height between this and the tide of the next day being 7ft. 5in. At the Victoria and Albert Dock it was 4ft. 5in. above the expected height, the following tide being 1ft. 11in. less than expected, the actual difference in height between the two tides being 7ft. 4in.

In London the water was nearly level with the top of the parapet of the Embankment and the footway was flooded. The Custom House Pier and several of the low-lying streets, both on the east and west sides of the river, were flooded, in some cases knee deep. Many basement floors were completely submerged and the cellars filled with water. Even up the river as high as Richmond the tide flowed over the towing path and the Twickenham Embankment.

At Blackfriars Bridge the tide rose to 4ft. 9in. above Trinity high water mark, and at Hammersmith to 4ft. 6in.

At Woolwich, where the Arsenal wharves are 4ft. above high water of spring tides, the water flowed over them, and it was only by the help of a great number of troops who were called out to assist, that a large amount of ammunition and stores placed ready for shipment was saved from destruction. The greater part of the Arsenal was flooded, and the fires in the boilers belonging to the electric light plant extinguished.

At Chatham considerable damage was done by floods, and at Rochester the gas works were inundated to a depth of 8ft. Between Sheerness and Queenborough the land was flooded, the water flowing over the railway into Blue Town, flooding the streets and filling the lower floors of the houses, from which the inhabitants had to be removed by boats. The tide broke over the dockyard wall and flooded all the lower portions of the yards and the basement of the Royal Naval Barracks to a depth of 8ft.

At Sheerness the water was 2ft. deep in the streets, and a large area of land in the neighbourhood inundated, the seawall near Scrapsgate having given way. The sewage outfall at West Minster was flooded and the pumping operations stopped; the railway line was also flooded. At Whitstable the tide overflowed the banks two hours before high water and swept across the Salts, carrying with it fences and storehouses, and breaking into the dwelling-houses. Some of the houses were under water to a depth of 8ft., and the High Street was from 3 to 4ft. under water. At Sittingbourne also great damage was done to the river wall, the water flowing a distance of two miles inland; great numbers of sheep and cattle were drowned.

The lower parts of Margate and of Herne Bay were inundated, and the houses filled with water.

At Broadstairs the old pier was submerged and considerbaly damaged.

The river Stour overflowed its banks and flooded the main streets of Sandwich; the marsh land for nearly two miles inland was inundated, including

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the golf links, and vehicular traffic along the main road between Sandwich and Ramsgate had to be suspended.

At Deal the water rose above shore level and flooded the streets and houses, considerable damage being done to the sea wall at the north end of the town.

At Dover the afternoon tide of the 29th rose 6ft. 1in. above its proper height, there being a difference of 8ft. between this tide and that of the next day.

At Newhaven the increased range of the tide was about 2ft. 4in., and at Portsmouth only 1ft. 8in. on the afternoon of the 29th.

The above is only a partial record of the immense extent of the damage done, the most serious amount of flooding perhaps that has been recorded, but it is sufficient to show the extent to which the tide may be influenced by gales of wind.—*Engineer*, December 17th, 1897.

FROMONDUS.

In our number for August we gave a list of the editions of Fromondus's six books on Meteorology, known, or reported to us; three others have been mentioned since, either in these pages or in those of *Ciel et Terre*. It seems to us that it may be well to sum up the facts as far as at present ascertained.

It appears that Prof. Monchamp's quotation of an edition dated 1655 was a mistake for 1656—so that is disposed of.

M. Lancaster, relying upon the *Biographie Nationale*, published by the *Académie des Sciences de Belgique*, quoted* one of 1634, and in *Ciel et Terre* (1897, p. 431) he quoted one of 1631, but in *Ciel et Terre*, on page 503 both Prof. Monchamp and M. Lancaster appear to admit that neither of these editions ever existed.

The hypothetical edition of 1670, which we called F, is disposed of by the printer's signatures (see *Met. Mag.*, 1897, pp. 118 119).

We are not aware what librarians have adopted as the definition of an edition; we think that the prefixing of a new title page, with a fresh publisher's name, or a fresh date, distinguishes one issue from another, but Prof. Monchamp seems to think not, and he (*Ciel et Terre*, 1897, p. 503) treats editions B and D as two issues of one edition. In this he is mistaken. We have both, and not merely do the titles differ, but also the decorated initial letters and the ornamental headlines. Although at first sight it might be held that the body of the work was identical, for the two run word for word, line for line, and page for page; close examination will show that the whole work has been set up afresh, as stated on the title page. In proof of this many differences can be detected, we quote four instances.

	Edition B 1639.	D 1656.
Page 135, line 4, last word	Nam.	N$\widehat{a}$.
„ 153, line 11 from bottom	extrinsecum.	eXtrinsecum.
„ 175, „ 14 „ „	avertisse.	evertisse.
„ 449, „ 3 „ „	oculum.	oculu$\widehat{m}$.

* *Met. Mag.*, 1897, p. 118.

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The final result is, that our list on p. 118 has, up to the present time, received no augmentations, and the only correction is that F disappears, and E can be called a 4to, although no one looking at it would do so.

ROYAL METEOROLOGICAL SOCIETY.

THE monthly meeting of this Society was held on Wednesday evening, December 15th, at the Institution of Civil Engineers, Mr. E. Mawley, F.R.H.S, President, in the chair.

The following candidates were ballotted for and duly elected:—Leonard Addenbrooke; James Diggle, A.M.I.C.E., F.G.S.; Ernest Romney Matthews, C.E.; T. T. S. Metcalfe, J.P.; William Ormerod, J.P.

Mr. R. C. Mossman, F.R.S.E., read a paper on the daily values of non-instrumental meteorological phenomena in London, from 1763 to 1896. The paper summarised records of snow, hail, gales, thunderstorms, fogs, &c., for each day in the last 134 years, thus exhibiting the daily march of the various phenomena throughout the year. Thunderstorms, it was shown, were at their maximum from the beginning of June to the middle of August, the greatest number being recorded in the week ending July 20th. A rapid decline set in at the beginning of August, and very few cases were recorded between October and March. Lightning, without thunder, was essentially a nocturnal phenomenon; and increased rapidly after the summer solstice. During January fogs were considerably above the average, but they diminished rapidly after the middle of February, falling to a minimum at the beginning of July. A marked increase took place during September, when the autumnal fall of temperature set in. A great many fogs were recorded about the middle of October, but the maximum extended from November 5th to 24th. This applied also to the density of fogs, as during the above period no less than 27 per cent. of all the fogs recorded were designated "thick," or "dense." At the end of November fogs diminished both in number and in density, only 15 per cent. being recorded as "dense" in the fortnight ending December 8th. Snow was at its maximum at the beginning of January, but the values at the beginning of March were also high. There was a curious increase in snowstorms about the middle of April, and an equally marked decrease at the beginning of December. The increase in April took place at the time of "the borrowing days," (new style) while the diminution in December was associated with the occurrence of a mild stormy period, which recurred from year to year at the beginning of that month, with few exceptions. Storms were most frequent at the end of January, and at their minimum in August. With regard to the occurrence of equinoctial gales it was shown that storms diminished rapidly before, during and after, the vernal

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equinox. During the second half of September a rapid increase took place, which rather supported, than otherwise, the popular opinion regarding gales at the autumnal equinox. On closer inspection it was seen that this period might be said to mark the termination of the tranquil summer conditions rather than the commencement of very stormy weather, which characterised the four months November to February.

Mr. W. Marriott read a paper on "the Rainfall of Seathwaite, Cumberland." This place has long been noted for its heavy rainfall, being, in fact, one of the wettest spots in the British Isles,—the average yearly amount is 137 inches. The spring months of April, May and June, are the driest, as they not only have the least rainfall, but also the least number of rainy days. August has the greatest number of rainy days. The heavy nature of the rainfall may be gathered from the fact that 21 per cent. of the falls are above 1 in., 2 per cent. being above 3 in. The greatest fall in one day was 8·03 in., on November 12th, 1897. The author has investigated the atmospheric conditions under which the heavy rainfalls occurred, and he finds that they are due to the direction and force of the wind. When the wind is blowing strongly from the south-east, or south-west, it will be concentrated in the valleys on the windward of Scafell, and rush up them with considerable force, the air current consequently being projected to a considerable altitude beyond Scafell. Owing to the reduction of temperature with elevation, the air parts with a great deal of its moisture, which falls as rain. With such a process going on continuously for a whole day, the heavy rainfall at Seathwaite is fully accounted for.

REVIEW.

Klima-Tabeller for Norge, of H. MOHN. II. Lufttryk. III. Luftens Fugtighed. Christiania. 1896 and 1897. Two parts, large 8vo, 80 pp. and 12 pp.

WE had the pleasure of noticing the first part of Prof. Mohn's excellent summaries of Norwegian meteorology, on p. 43 of our last volume; that dealt with temperature, the two parts now before us deal respectively with pressure, and with humidity.

As there are doubtless other parts to follow, we take this opportunity of expressing the hope that, before completing this valuable monograph, Dr. Mohn will give a map of the stations,—we are aware that he gives full particulars as to the lat. and long. of each, but it would be much more handy to have in the book itself a sketch map showing their distribution.

II. Lufttryk (Pressure). This is, like all Dr. Mohn's work, a thoroughly practical, well arranged, and nearly complete treatise,—we say nearly complete because some diagrams would add to its value. The first section gives full details as to the barometers used

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at the central station, and a history of all the comparisons made between them and the standards at Kew, Greenwich, Paris, and other places. Then follows a life history of the barometers at 46 other stations. After this we have a specimen of the process adopted for completing short period records, a list of the stations with lat., long., altitude, beginning, ending and duration of the record, and particulars as to the normal stations, whence (if the record does not cover the whole of the 25 years, 1866-90) the values have been completed. Table II. gives for each station the mean pressure for each month, and for the year, on the average of 25 years. But we cannot go through all these excellent tables, in which apparently nothing has been forgotten. We must pick out one or two facts and pass on. Apparently the greatest and the least mean annual pressure at sea level are—

	in.	
Greatest.....	29·928 at Tonset,	in Lat. 62° 17′ N., Lon. 10° 45′ E.
Least.....	29·768 at Gjesvær,	,, 76° 6′ N., ,, 25° 22′ E.

The individual extremes reduced to sea level are given by Dr. Mohn as—

	in.	
Highest..	31·174 on Feb. 6th, 1895, at Vardø,	Lat. 70° 22′ N., Lon. 31° 8′ E.
Lowest..	27·760 on Jan. 27th, 1884, at Bergen,	,, 60° 23′ N., ,, 5° 21′ E.

III. Luftens Fugtighed (Humidity). This subject is treated very similarly to the Pressure, we need, therefore, say only a few words as to the results. As regards vapour tension, the maximum at all stations is in July *or* August, and most generally in July; the minimum is at all stations in January, February, or March, and most generally in February. The relative humidity is at its maximum at nearly every station in one of the four months August to November, the minima are spread over the spring months February to June.

Some marvellously low values are reported as the extremes of relative humidity; an entry of 3 at Vardø has a ? but there is 8 at Christiania, and 10 is reported from Domaas, Lærdalsøren, Brønø, and Bodø, and 11 or 12 at many stations. After that who will say that Norway is always damp ?

INCLINED AIR CURRENTS.

To the Editor of the Meteorological Magazine.

SIR,—It may interest you, and through you some of the readers of the *Meteorological Magazine*, to know that it is easy to observe the vertical component of the motion of the wind by means of a simply constructed wind vane, and that quite a new field of interesting investigation is thus opened up.

The vane I have constructed is of $\frac{5}{8}$ inch brass rod. At one end two saw cuts have been made, each at a right angle to the other, in the direction of its length, and in them are fixed two circular sheets

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of brass, 6 inches diameter, intersecting at a right angle; the vane is altogether about 2 ft. long. It is pivoted at its balancing point in a metal support, which is fixed in a short length of brass tube, and rests on a metal point, fitting easily into this tube, so as to allow it, with the vane, to revolve in the horizontal plane freely, and the pivot allows it to oscillate, within limits, fixed by springs, of about 35° up or down from the horizontal. Placed at a height of about 50 ft. above the ground, it indicates the direction of the wind truly, both horizontally and vertically.

My observations hitherto made seem to indicate that strong winds sometimes blow at inclinations as great as at least, 30° above or below the horizontal, and that whether these comparatively steady inclinations are themselves parts of atmospheric waves or not—more rapid waves are very general. These observations, if verified, seem to be important to architects, engineers, and those who are endeavouring to work out the problem of a flying machine. One can notice how a bird, with its beautiful living organism adapted to its environment, can utilise these air waves in its soaring flight; but I fear that they will sorely disturb the equilibrium of any machine launched in the free air.

One observation, in the calm centre of a great cyclone of moderate intensity, seemed to indicate a steady, moderate, upward motion of the atmosphere there, replenished presumably from all sides below. This evidently is a very different thing from the violent upward motion in the centre of a small whirlwind. Generally there appears to be an upward motion in the centre of a V depression, and vice versa. The mechanism of land and sea breezes, with their upward and downward motions is well shown.

I am sure that a very wide field of investigation in connection with variations in barometric readings, influenced by upward or downward movements of the atmosphere, is open to any observers who provide themselves with simple instruments of this sort, and place them in open situations, at, I suppose, not less than 30 ft. above the surface of the ground.

I send you this short sketch of my early enquiries in this direction in the hope that if publicity be given to the subject, many meteorologists may be led to give their attention to it, and that combined observations, with good instruments, may largely increase our knowledge.

I am, sir, faithfully yours,

H. SCHAW,
Major-General, R.E., C.B.

Aurora Terrace, Wellington, New Zealand.
27th October, 1897.

[General Schaw's letter has come so far, and is in many respects so interesting, that we gladly insert it, and think it not improbable that some of our correspondents may take up the subject. The

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General's instrument is evidently very inexpensive, but it produces no record. The first instrument, not merely to show, but to record, the inclination of the wind, was brought out by Dalberg, in 1780; those by Benzenberg, Cacciatore, Hennessy, and Dechevrens, are described by Professor Laughton in his "Historical sketch of anemometry." (*Quar. Jour. R. Met. Soc.*, VIII., (1882) pp. 174-175). We have an impression that an indicator of inclination was attached to the Atmospheric Recorder constructed by Mr. G. Dollond, for Mr. H. Lawson, and erected at Nottingham, but in neither of the descriptive pamphlets prepared by Mr. Dollond is there any reference to the subject. The last and most elaborate effort in this direction was made by Mr. L. M. Casella, and is described and illustrated in the *Quar. Jour. R. Met. Soc.*, XII., (1886) pp. 246-253.

The great cost of most of the recording patterns is an obstacle to their introduction, and most of them must be placed on piers or buildings which necessarily produce deflections in the very currents, the inclination of which they are intended to measure. We are therefore disposed to think that systematic observation of General Schaw's pattern, mounted on a very tall pole, would give more trustworthy results than any of the recorders.—ED.]

KITE FLYING IN SCOTLAND.

To the Editor of the Meteorological Magazine.

SIR,—With reference to the notice in the current issue of *Met. Mag.*, *re* Scientific Kite Flying, it may be of interest to state that several experiments with kites of the Blue Hill pattern have been made here during the past two months. No instruments have as yet been sent up, but we hope to have the ingenious apparatus of M. Richard at work soon. The trials have been carried out under the direction of Mr. John Anderson (late of Owensboro, Kentucky), and have, on the whole, been successful. An improved hand winch is at present under construction, which, with the substitution of piano wire for cord, will, we hope, yield satisfactory results.

I am, Yours very truly,

R. C. MOSSMAN.

10, Blacket Place, Edinburgh, Jan. 4th, 1898.

WARM WINTER NIGHTS.

To the Editor of the Meteorological Magazine.

SIR,—I think that the high minimum temperature of the night of December 17th, 1897, should not pass without notice. On the morning of the 18th I recorded 53°·2 in my Stevenson screen, and

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52°·7 in the old screen, as the lowest temperature of the preceding 24 hours; both are verified thermometers. I had only one other minimum equalling 50°·0 in the nineteen Decembers from 1878 to 1896 inclusive, viz.: 50°·8 on December 4th, 1889. In the "Greenwich Met. Obs.," Part III., Temperature 1841–1890," there is no minimum in December exceeding 52°·0; this, therefore, seems to have been most exceptional.

While on the subject of high minima, permit me to point out what appears to be an error on p. 116, Vol. 28 of the *Met. Mag.* I find in the above Greenwich records that 60°·0 was the minimum on August 8th, 1846, and not 68°·0. The highest recorded at Greenwich during 50 years was 66°·1, on July 26th, 1872; that of August 18th, 1893, is therefore unprecedented since 1841. Again, minima above 60° can hardly be described as *very* rare; at Greenwich they average about four per annum, and in the *Met. Mag.* for September, 1897, p. 123, you state that at Camden Square you have two every August on the average.

Minima above 64° are very rare. Howard records eight in 25 years, the highest being 70° on July 27th, 1814. Mr. *Cowe's Register* records 26 in 46 years. Greenwich only four in 50 years.

Yours very truly,

CHARLES L. BROOK.

Harewood Lodge, Meltham, Dec. 20th, 1897.

[Mr. Brook is right and we were wrong in Vol. 28, but we can plead extenuating circumstances. It is printed (wrongly) in the Greenwich Observations for 1846 as 68°·0, but at that time observations were being taken every two hours, and from them it is obvious that 68°·0 is wrong, and 60°·0 right. We agree with Mr. Brook as to the use of the words "rare," and "very rare," and only think it necessary to add that a consideration of the position of the Rev. J. Cowe's thermometer (see the photo and plan in the volume) will explain the number of high minima recorded by him—the surrounding walls would radiate heat at night and prevent proper cooling. —ED.].

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CLIMATOLOGICAL TABLE FOR THE BRITISH EMPIRE, JULY, 1897.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Absolute. Maximum. Date.	Absolute. Minimum. Temp.	Absolute. Minimum. Date.	Average. Max.	Average. Min.	Average. Dew Point.	Average. Humidity.	Absolute. Max. in Sun.	Absolute. Min. on Grass.	TotalRain. Depth.	TotalRain. Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
England, London	83·6	24	44·0	8	75·8	55·3	52·9	68	130·1	36·1	·64	8	4·0
Malta	97·0	15	66·3	31	88·2	71·5	67·0	69	159·7	58·4	·09	2	2·0
Mauritius	78·5	23	59·8	13	75·9	64·9	59·6	71	121·5	50·4	1·50	10	5·2
Calcutta	97·7	3	74·6	14	88·5	78·7	77·8	84	156·3	74·2	13·45	18	7·7
Bombay	89·7	2	73·9	17	84·9	77·7	77·3	87	143·6	73·9	30·19	28	8·7
Ceylon, Colombo	88·2	...	73·0	4	86·5	78·1	73·7	80	139·0	71·0	5·24	22	6·4
Melbourne	66·1	30	34·6	29	57·0	44·5	44·0	78	115·2	26·0	2·45	14	7·2
Adelaide	67·7	17	38·9	28	60·0	46·5	45·8	79	124·2	29·2	1·81	16	6·0
Sydney	66·9	31	41·4	18	60·3	47·6	45·2	82	110·2	29·9	6·58	7	4·2
Wellington	62·0	26	31·0	20	54·8	43·3	39·5	71	105·0	21·0	3·31	20	4·5
Auckland	61·0	14	40·0	3	57·7	46·8	43·1	71	120·0	38·0	5·23	25	6·2
Jamaica, Kingston	92·4	23*a*	70·8	23	89·1	73·5	70·9	71	...	...	1·74	10	6·2
Trinidad	92·0	26*b*	67·0	15	87·6	70·6	73·8	83	167·0	66·0	13·88	23	...
Grenada	86·0	21	70·2	30	83·2	74·6	71·2	75	152·0	...	7·51	22	2·8
Toronto	93·3	5	53·0	15	81·4	63·5	64·1	74	109·4	50·2	5·24	13	4·4
New Brunswick, Fredericton	92·7	8	45·5	4	78·7	55·8	61·4	67	...	...	3·42	12	5·4
Manitoba, Winnipeg	88·5	17	47·0	12	79·0	56·8	...	...	...	...	5·38	14	5·8
British Columbia, Esquimalt	77·7	12	45·1	25	68·2	50·5	51·7	82	...	...	·97	8	4·8

a—and 30. *b*—and 27.

REMARKS.

MALTA.—Adopted mean temp. 78°·4, or 0°·9 above the average. Mean hourly velocity of wind 8·6 miles. Average sea temp. 80°·0. T8 on 5th, L on 6th.
J. F. DOBSON.

Mauritius.—Mean temp. of air 1°·0 above, of dew point 0°·2 above, and rainfall ·76 in. below, their respective averages. Mean hourly velocity of wind 12·1 miles, or 0·3 above average; extremes, 29·1 on 22nd, and 2·0 on 24th; prevailing direction E.S.E.
T. F. CLAXTON.

CEYLON, COLOMBO.—Mean temp. of air 81°·6, or 1°·1 above, of dew point 0°·3 above, and rainfall ·84 in. above, their respective averages. Mean hourly velocity of wind 10·3 miles; prevailing direction S.W.
H. O. BARNARD.

Adelaide.—Mean temp. 1°·7 above the average of 40 years. Rainfall ·84 in. below average. In the northern agricultural districts the rainfall was generally above the average.
C. TODD, F.R.S.

Sydney.—Rainfall 2·34 in. above, humidity 5·5 above, and temperature 1°·6 above, their respective averages. Heavy general rains fell in continuance of those in June, and a high flood occurred on the Darling.
H. C. RUSSELL, F.R.S.

Wellington.—From 12th to 22nd generally showery, and also at the end of the of the month; the remainder fine. Variable winds, generally moderate. L on 8th, 15th, and 16th, and T and L on 19th. H on 8th, 17th, and 18th. Temp. 1°·4 above, and rainfall 3·03 in. below, the average. Slight earthquake on 8th.
R. B. GORE.

Auckland.—A showery and stormy month, rain being registered on 25 days, and the total nearly ·50 in. above the average. Mean temp. and barometric pressure both slightly above the average.
T. F. CHEESEMAN.

JAMAICA, KINGSTON.—Frequent thunderstorms.
J. F. BRENNAN.

TRINIDAD.—Rainfall 4·43 in. above the average of 30 years.
J. H. HART.

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SUPPLEMENTARY TABLE OF RAINFALL, DECEMBER, 1897.

For the Counties, Latitudes, and Longitudes of most of these Stations, see *Met. Mag.*, Vol. XIV., pp. 10 & 11.]

Div.	STATION.	Total Rain.	Div.	STATION.	Total Rain.
		in.			in.
I.	Uxbridge (Harefield Pk.)	2·91	XI.	Rhayader, Nantgwillt ...	11·05
II.	Dorking, Abinger Hall .	4·25	,,	Lake Vyrnwy	8·94
,,	Birchington, Thor	2·63	,,	Corwen, Rhug	5·22
,,	Hailsham	3·51	,,	Criccieth, Talarvor	4·50
,,	Ryde, Thornbrough	3·31	,,	I. of Man, Douglas	5·36
,,	Emsworth, Redlands ...	3·09	XII.	Stoneykirk, Ardwell Ho.	4·48
,,	Alton, Ashdell	5·60	,,	New Galloway, Glenlee	11·81
III.	Oxford, Magdalen Col..	2·28	,,	Moniaive, Maxwelton Ho.	10·04
,,	Banbury, Bloxham	3·55	,,	Lilliesleaf, Riddell	4·62
,,	Northampton, Sedgebrook	2·39	XIII.	N. Esk Res. [Penicuick]	5·00
,,	Duddington [Stamford].	2·06	XIV.	Glasgow, Queen's Park..	5·56
,,	Alconbury	1·46	XV.	Inverary, Newtown	9·44
,,	Wisbech, Bank House...	1·45	,,	Oban, The Corran	6·90
IV.	Southend	1·94	,,	Islay, Gruinart School ...	4·16
,,	Harlow, Sheering..... ...	2·70	XVI.	Dollar.....	5·87
,,	Colchester, Lexden	1·77	,,	Balquhidder, Stronvar...	10·94
,,	Rendlesham Hall	1·53	,,	Ballinluig	(4·00)
,,	Rushall Vicarage	2·00	,,	Dalnaspidal H.R.S.....	9·07
,,	Swaffham	1·86	XVII.	Keith H.R.S.....	3·96
V.	Salisbury, Alderbury ...	5·64	,,	Forres H.R.S.	2·28
,,	Bishop's Cannings	3·95	XVIII.	Fearn, Lower Pitkerrie..	2·07
,,	Blandford, Whatcombe .	5·95	,,	N. Uist, Loch Maddy ...	7·11
,,	Ashburton, Holne Vic...	14·46	,,	Invergarry.....	12·26
,,	Okehampton, Oaklands.	9·29	,,	Aviemore H.R.S.	5·41
,,	Hartland Abbey	5·35	,,	Loch Ness, Drumnadrochit	5·77
,,	Lynmouth, Glenthorne.	8·73	XIX.	Inversbin	3·64
,,	Probus, Lamellyn	6·77	,,	Scourie	...
,,	Wellington, The Avenue	6·02	,,	Watten H.R.S.....	2·17
,,	Wincanton.....	6·08	XX.	Dunmanway, Coolkelure	10·65
VI.	Clifton, Pembroke Road	4·31	,,	Cork, Wellesley Terrace	4·25
,,	Ross, The Graig	3·60	,,	Killarney, Woodlawn ...	11·85
,,	Wem, Clive Vicarage ...	2·23	,,	Caher, Duneske	4·42
,,	Cheadle, The Heath Ho.	3·75	,,	Ballingarry, Hazelfort...	3·54
,,	Worcester, Diglis Lock	2·57	,,	Limerick, Kilcornan ...	3·87
,,	Coventry, Priory Row ..	2·80	,,	Broadford, Hurdlestown	3·68
VII.	Grantham, Stainby	2·30	,,	Miltown Malbay	7·83
,,	Horncastle, Bucknall ...	2·01	XXI.	Gorey, Courtown House	4·22
,,	Worksop, Hodsck Priory	2·02	,,	Athlone, Twyford	4·48
VIII.	Neston, Hinderton	2·18	,,	Mullingar, Belvedere ...	3·84
,,	Southport, Hesketh Park	2·98	,,	Longford, Currygrane...	5·37
,,	Broughton-in-Furness ...	8·09	XXII.	Woodlawn	5·65
IX.	Ripon, Mickley.....	3·47	,,	Crossmolina, Enniscoe ..	7·78
,,	Melmerby, Baldersby ...	2·81	,,	Collooney, Markree Obs.	4·65
,,	Scarborough, Observat'y	1·52	,,	Ballinamore, Lawderdale	...
,,	Middleton, Mickleton ...	2·92	XXIII.	Warrenpoint.....	4·36
X.	Haltwhistle, Unthank...	4·16	,,	Seaforde..	4·78
,,	Bamburgh	2·25	,,	Belfast, Springfield	5·38
,,	Keswick, The Bank.....	11·35	,,	Bushmills, Dundarave..	4·64
XI.	Llanfrechfa Grange	7·28	,,	Stewartstown	4·79
,,	Llandovery	7·48	,,	Killybegs	7·07
,,	Castle Malgwyn	8·39	,,	Lough Swilly, Carrablagh	5·61
,,	Builth, Abergwesyn Vic.	14·70			

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DECEMBER, 1897.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	RAINFALL. Total Fall.	Difference from average 1880-9.	Greatest Fall in 24 hours. Dpth	Greatest Fall in 24 hours. Date	Days on which ·01 or more fell.	TEMPERATURE. Max. Deg.	Max. Date	Min. Deg.	Min. Date.	No. of Nights below 32°. In shade.	No. of Nights below 32°. On grass.
			inches.	inches.	in.								
I.	ENGLAND.	London (Camden Square) ...	2·20	+ ·13	·64	7	17	55·9	16	23·7	26	10	17
II.		Tenterden ...	3·28	+ ·65	·70	7	22	54·0	16*b*	21·5	26	10	16
,,		Strathfieldsaye ...	...	...	...	...	...	...	...	...	...	...	...
III.		Hitchin ...	2·32	+ ·29	·48	7	19	56·0	16	22·0	22	12	...
,,		Winslow (Addington) ...	3·07	+ ·62	·57	29	18	58·0	16	20·0	24	14	16
IV.		Bury St. Edmunds (Westley)	1·71	— ·53	·43	7	12	54·0	17	27·0	4	...	...
,,		Norwich (Brundall) ...	1·82	...	·33	7	17	54·2	17	21·2	23	9	20
V.		Weymouth(LangtonHerring)	...	...	...	...	...	...	...	...	...	...	...
,,		Torquay (Cary Green)	7·16	...	2·14	29	18	56·6	16	32·0	3	1	4
,,		Polapit Tamar [Launceston]..	6·27	+ 2·04	·99	29	22	57·1	16	27·6	3	4	11
VI.		Stroud (Upfield) ...	4·02	+ 1·57	·72	29	18	57·0	16	26·0	22	14	...
,,		ChurchStretton(Woolstaston)	3·63	+ ·58	·58	7	21	55·0	16	26·5	23	11	18
,,		Tenbury (Orleton) ...	...	...	...	...	...	...	...	...	...	...	...
VII.		Leicester (Rotherby Hall) ...	2·65	...	·76	4	21	...	...	...	...	...	...
,,		Boston ...	1·23	— ·62	·32	13	12	54·0	16	22·0	23	14	...
,,		Hesley Hall [Tickhill]...	1·98	·00	·34	7	18	58·0	16	19·0	24	14	...
VIII.		Manchester(PlymouthGrove)	3·72	+ ·28	·92	7	17	56·0	16	25·0	22	12	14
IX.		Wetherby (Ribston Hall) ...	1·02	— 1·42	·31	7	12	...	...	...	...	...	...
,,		Skipton (Arncliffe) ...	11·00	+ 4·19	1·56	7	23	...	...	...	...	...	...
,,		Hull (Pearson Park).	2·04	— ·23	·65	13	13	57·0	16*b*	24·0	22*f*	12	15
X.		Newcastle (Town Moor) ...	2·38	+ ·08	·80	7	18	...	...	...	...	...	...
,,		Borrowdale (Seathwaite)...	20·57	+ 5·76	2·50	29	23	...	...	...	...	...	...
XI.	WALES.	Cardiff (Ely)...	6·92	+ 2·37	1·53	7	18	...	...	...	...	...	...
,,		Haverfordwest ...	7·41	+ 2·42	·76	5	21	56·0	17	26·2	3	5	18
,,		Aberystwith (Gogerddan) ...	3·69	— 1·19	·65	7	17	56·0	17	...	...	...	...
,,		Llandudno...	3·77	+ ·81	·80	7	18	60·0	27	30·0	22	2	...
XII.	SCOTLAND.	Cargen [Dumfries] ...	11·24	+ 7·22	1·80	26	20	56·0	17	20·0	23	12	...
XIII.		Edinburgh (Blacket Place)...	2·45	...	·39	28*a*	15	54·0	27	24·9	23	10	18
XIV.		Colmonell	6·97	...	·75	26	20	54·0	27	25·0	2	...	...
XV.		Lochgilphead (Kilmory)...	...	...	...	...	...	...	...	...	...	...	...
,,		Mull (Quinish)...	6·35	— 1·22	·81	6	21	...	...	...	...	...	...
XVI.		Loch Leven Sluices ...	6·00	+ 2·69	·90	9	15	...	...	...	...	...	...
,,		Dundee (Eastern Necropolis)	3·35	+ 1·27	·50	5	19	52·6	17	21·9	23	12	...
XVII.		Braemar	4·99	+ 2·52	·81	8	17	50·0	27	16·0	23	18	29
,,		Aberdeen (Cranford)	3·68	...	·90	10	23	51·0	26	20·0	22*f*	18	...
,,		Cawdor (Budgate) ...	3·04	+ ·58	·50	8	23	...	...	...	...	...	...
XVIII		Strathconan [Beauly] ...	8·91	+ 3·14	1·50	27	13	...	...	...	...	...	...
,,		Glencarron Lodge...	9·65	...	1·25	8	22	53·6	26	21·2	22	13	...
XIX.		Dunrobin ...	2·78	— ·59	·81	8	13	51·0	27	23·8	23	10	...
,,		S. Ronaldsay (Roeberry)...	4·40	+ ·74	·60	11	17	49·0	17*c*	32·0	2	1	...
XX.		Darrynane Abbey...	6·25	...	·63	12	22	...	...	...	...	...	...
,,		Waterford (Brook Lodge) ...	5·48	+ 1·84	·82	12	21	56·0	26	29·0	3	2	...
,,	IRELAND.	O'Briensbridge (Ross) ...	5·27	...	·54	25	19	...	...	...	...	...	...
XXI.		Carlow (Browne's Hill) ...	3·47	+ ·35	·53	7	23	...	...	...	...	...	...
,,		Dublin (FitzWilliam Square)	1·84	— ·32	·26	5	18	57·8	27	32·9	3	0	12
XXII.		Ballinasloe	4·59	+ 1·17	·90	26	21	50·0	16	28·0	31	5	...
,,		Clifden (Kylemore)	11·91	...	1·58	29	24	...	...	...	...	...	...
XXIII		Waringstown ...	4·57	+ 1·53	1·07	26	17	55·0	16*d*	28·0	2*g*	8	19
,,		Londonderry (Creggan Res.).	4·62	+ ·41	·62	26	21	...	...	...	...	...	...
,,		Omagh (Edenfel) ...	4·65	+ ·97	·93	26	20	52·0	7*e*	29·0	22	10	16

+ Shows that the fall was above the average ; — that it was below it.

a—and 29. *b*—and 17. *c*—and 26. *d*—and 26, 27. *e*—and 16, 25. *f*—and 23. *g*—and 22.

METEOROLOGICAL NOTES ON DECEMBER, 1897.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow.

ENGLAND.

TENTERDEN.—A wet month at last, but not enough R to fill up ponds and springs. The second week very wet, and the last five days showery. Much wind at times. Hard frost from 22nd to 26th. Duration of sunshine 67 hours. Dense fog nearly all day on 18th. Gales from S.W. on 7th, N.W. on 11th, and S on 29th and 30th. On 1st, 6 hrs. 40 min. of sunshine, and on 25th, 6 hours.

ADDINGTON.—Max. temp. rather high at times; from the 13th to the 17th it averaged 54°, and from the 24th to the end, 50°. Sharp frost on the 4th, and again from 23rd to 26th. On the 18th thick fog all day. Wind high on several days. Floods on the 15th and 30th.

BURY ST. EDMUNDS, WESTLEY.—A mild and windy month, with no snow.

NORWICH, BRUNDALL.—A mild and stormy month, with some sharp rime frosts at Christmas. At the close of the month violets, chrysanthemums and Christmas roses were in full bloom in the garden, with winter aconites and snowdrops coming through the soil, and nearly ready to bloom. H, sleet, and a few flakes of S on 2nd. Gales on 7th, 29th, and 30th.

TORQUAY, CARY GREEN.—Rainfall 3·69 in. above the average. Mean temp. 46°·0, or 3°·1 above the average. Duration of sunshine 79 hrs. 10 min., being 27 hrs. 5 min. above average; 10 sunless days.

POLAPIT TAMAR.—Very wet and stormy, and unseasonably warm. H on 1st, 8th, 9th, and 28th. L and T at 4.30 p.m. on 14th. Gales from S. on 7th and 10th, W.S.W. on 8th and 13th, S.S.W. on 16th, 26th, and 29th.

STROUD, UPFIELD.—S.W. gales on 7th, 13th, 16th, 28th and 29th. L and T on 14th.

WOOLSTASTON.—Stormy weather prevailed in the early part of the month, with heavy gales on 7th and 8th, and again on 26th and 29th. There was a good deal of sharp frost, but the middle of the month was mild and genial. Mean temp. 39°·4.

ROTHERBY HALL.—Rainfall ·65 in. above the average, and the month was dull and damp, with much wind. On the 4th more than half an inch of S fell. On the 23rd the temp. on grass fell to 12°.

HULL, PEARSON PARK.—H on 2nd. Fog on 5th, 12th, 13th, 14th, 18th, 19th, 22nd, 23rd, and 24th. Stormy on 28th, 29th and 30th.

WALES.

HAVERFORDWEST.—December was wet and stormy up to the 16th, with temp. above the mean, and vegetation in a luxuriant condition; a mild frost then set in, with much mist and fog, and grass temp. rather low (18°·6 on 23rd), this weather lasted until the 25th. Another stormy wet period followed, which lasted to the end of the month. The wettest December since 1891, when 7·87 in. fell.

ABERYSTWITH, GOGERDDAN.—Strong gales from 27th to 30th.

LLANDUDNO.—T and L on 30th. Lunar halo on 12th. Rainbows seen on six days, that on 27th lasting for four hours.

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SCOTLAND.

CARGEN [DUMFRIES].—A month of wet, unsettled weather, the rainfall (11·24 in.) being the heaviest in any month since observations commenced in 1860, the nearest approach to it being 10·72 in. in October, 1874; 6·50 in. fell in the last six days, quite the heaviest fall ever experienced here. The fall of 1·80 in. on 26th has been exceeded on only 5 days during 38 years. The mean temp. is 1° above the average for December, and on only 11 days did the minimum fall below 32°. On 26th it blew hard from S.E., and easterly winds prevailed on 14 days. T and L occurred on 4 days, and a severe TS, during which the L was very vivid, on the evening of the 30th; slight S fell on 8th. Sunshine was conspicuous by its absence, and during 18 days the sun was never seen.

EDINBURGH, BLACKET PLACE.—S on 1st and 8th. Dense fog on 18th, 22nd, 23rd, and 24th.

COLMONELL.—Rain 1·90 in. above, and mean temp. 4°·1 above, the average of 21 years.

MULL, QUINISH.—With the exception of a week of fine weather, with some frost from 18th to 24th, the month was mild, wet and stormy. A gale of unusual violence blew from S.S.W. on the 30th.

BRAEMAR.—A wet, but open month.

ABERDEEN, CRANFORD.—Very mild and warm, the mean temp. on some nights being between 40° and 45°.

S. RONALDSAY, ROEBERRY.—Not a bad month upon the whole, although the rainfall is ·93in. above the average of 30 years. Mean temp. 40°·7, or 1° above the average.

IRELAND.

DARRYNANE ABBEY.—A wet, but mild month; the middle part very wild and stormy. N.W. gale with H showers on 8th. Strong S.W. gale, and very heavy sea on 15th.

WATERFORD, BROOK LODGE.—H and sleet on 8th. H on 13th, 27th, and 30th. The Comeragh mountains well covered with S on 9th. Mean temp. 44°·8.

O'BRIENSBRIDGE, ROSS.—A very dreary and wet month, excepting one week from 16th to 24th, Frequent and severe gales, mostly from S.E.

DUBLIN, FITZWILLIAM SQUARE.—A changeable open month, with frequent, but not heavy rain, and almost entire absence of frost. Mean temp. 44°·9, or 3°·6 above the average. A lunar halo was seen on the 9th. High winds were noted on 15 days, and attained the force of a gale on 7 occasions. Foggy on 7 days. S and sleet on the 8th; H on the 14th. Aurora borealis on the 11th. L on the evening of the 14th.

KYLEMORE HOUSE.—Gales on 3rd, 8th, 13th, 26th, 27th, and 29th. Weather very wild on 14th, 15th, and 28th.

OMAGH, EDENFEL.—Another mild month, with considerable rainfall, but no snow or frost of any severity. Christmas day was especially soft and springlike with a mean temp. of 46°·5

END OF VOL. XXXII.

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